

THE IRON AGE

New York, November 4, 1915

ESTABLISHED 1855

VOL. 96 : No. 19

Materials Employed in Case Hardening

An Enumeration of the Various Substances Used—Advantages of the Natural and Manufactured Materials Compared

BY R. A. MILLHOLLAND*

Of all the forms of heat treating, no doubt case hardening is the most extensively employed. It is merely an application of the old cementation process of making steel from iron. Of course, improvements have been made over the original methods, both in the process and in the materials involved. There are two prime requisites that case hardening fulfills more efficiently than any other process known to modern mechanical science, namely, a very hard non-wearing surface and tough malleable core that is capable of absorbing an enormous amount of vibration without serious difficulty.

The application of the process of case hardening is too extensive for exhaustive enumeration in this limited space. Generally speaking, short shafts, pins, bolts, collars, thrust rings, screws, bearings, spindles, gears, ratchets, clutch dogs, or any machine parts that are made of steel and are subject to wear, can be advantageously case hardened at a very small cost. The writer has in mind a company that makes a practice of case hardening all the steel parts of its tools and jigs used in the manufacture of automobiles. The maintenance on these tools is surprisingly low. Locating lugs and centering blocks do not wear away on the edges and become inaccurate. Practically the only replacement that is done on the tools at all is of drill bushings and boring bar guides. The locking devices, set screws, and clamps showed no sign of wear after months of constant production. One small cotter pin hole has had 40,000 shackle bolts pass through it and it is still as accurate as micrometers can measure. The same jig was replaced three times in drilling 20,000 holes before the case-hardened jig was made. No change in design was made; only the case-hardened feature was added. Any steel surface, whether a bearing one or not, that is liable to be nicked or marred by rough handling can be made practically indestructible by case hardening. The advantage of the process of case hardening low-carbon steel in place of using high-carbon tool steel is obvious in many instances, yet it must be clearly understood that case hardening is not a cure-all shin plaster to be used indiscriminately for any and all purposes. Each firm must learn largely from experience what can be case hardened to advantage.

Let us first have clearly in mind what is meant by the term case hardening, and the cementation process. We must hark back to the days when the art of making steel was new,—how far back no one really knows, but the names of Damascus and Toledo are familiar to all readers of history. Were you to ask one of these readers what was the most striking thing that he remembered about these two ancient cities, no doubt the answer would be: "The swords of Damascus and blades of Toledo." Without a doubt both of these famous steels were made by the cementation process with some improvements, the secrets of which died with the prestige of the cities.

A fine grade of wrought iron was the base upon which the cementation process was founded. Flat bars of iron were placed in furnaces packed in layers of charcoal and subjected to a temperature in the range of 1400 to 1650 deg. Fahr. The carbon in the charcoal was dissolved by the iron and when carbon had penetrated the steel and thoroughly saturated it, the cementation was considered complete and the bars were removed and "stack welded" one upon the other to a homogeneity that has been the envy of succeeding generations of steel craftsmen. The ancients realized the value of "working" their steels and the results secured were remarkable. The writer does not want to be misunderstood, however, causing some to believe that ancients could produce better steel than our latest modern manufacturers do. The ancients had nothing to surpass or even equal the chrome-vanadium steel of to-day.

The process of case hardening, then, is nothing but the proper regulation of the cementation or infusion process, as some see fit to call it. The old method of using charcoal as a means of injecting, or infusing, the carbon into the iron is slow and costly. Many newer and better materials have been discovered which are far superior to the old charcoal process.

It was discovered some years ago that the presence of nitrogen in the carbonizing material materially increased the speed of penetration or infusion of carbon into the surface of the iron. It was found after investigation that nearly all of the numerous patented carbonizing compounds have only two really essential elements in them, and despite the claims of the virtues of their respective products, carbon and nitrogen still remain the two

*Consulting metallurgist Millholland Tool Company, Indianapolis, Ind.

major elements involved in case hardening. It is of little or no consequence to the practical man, whether the carbon penetrates the steel in a gaseous or solid state. Let the ultra-scientific theorize on that subject and meanwhile let us consider the natural carbonizers and their faults and virtues. Among the natural carbonizers, those most extensively used are granulated bone, charred hoofs and leather, beet sugar pulp and crude raw sugar. Granulated bone is no doubt the most widely used of all carbonizers and while it has some almost unforgivable evils, its availability and price make it a universally used carbonizer. Its one and only great drawback is the high phosphorus content which has a noticeable effect on the toughness of the case-hardened area, making it brittle and prone to chip or flake off in service. However, after bone has once been burnt over and still contains a high percentage of carbon, the danger from the phosphorus decreases with the number of times the bone is used. I should say that 36 hr. of actual carbonizing heat is all that bone will stand and give any kind of results at all. If the bone is properly fortified after each heat, it can be used repeatedly, and grows better in carbonizing quality after each fortification. Highly uniform results can be obtained by uniform methods in fortifying the "spent" bone. By fortifying I mean restoring the carbonizing power of the bone. Bone is made up largely of lime which really forms the body or structure of the bone and is in evidence when after repeated heatings small bits of chalky white substance are found in the mass of burnt-over bone indicating that the bone is almost spent or burnt out. The writer has developed a method of his own regarding this process of refortifying spent bone and will gladly furnish any fellow craftsman with more particular details than this limited space will permit.

Charred hoofs and leather when mixed with hickory charcoal make a very good carbonizer, but the mixture is very uncertain and where uniform results are required the fortified bone is best and costs much less. Beet sugar pulp is obtainable from any sugar refinery at a surprisingly low cost, and in the writer's estimation has no rival for case hardening nuts and screws as the work comes from the carbonizing pots without any adhering dust particles and fused bits of metal that we often find in the charred leather. Five hours is the longest heat that beet sugar pulp will stand before it is spent and nothing is left but a light flaky dust in the cans. The shrinkage of the pulp is at least 30 per cent. Beet sugar pulp is high in volatile carbonizing gases and for that reason the carbonizing retorts must be thoroughly gas tight to secure the depth of case in the parts undergoing case hardening.

Now let us consider the artificial, or rather the manufactured, case-hardening compounds. Some are patented, but many are not, and I shall describe several different brands. Each manufacturer of carbonizing compound quite naturally claims his to be the best, and I have pamphlets and booklets on my desk that show clearly and quite convincingly, I confess, that the particular brand of carbonizer exploited in the pamphlet is the best obtainable. I might truthfully say that I have not run across any real bold frauds in this particular line, at least not within the last six years, and any of the better known products are safe and reliable carbonizers to use, that is, disregarding the economical side of the question. I have found all of the present carbonizing compounds put out by the manufacturers to be very expensive, and they all

lose their body and disintegrate into fine dust and do not respond to fortifying as well as the natural bone does. For very fine work I strongly recommend the use of a manufactured carbonizer because the results obtained are undoubtedly the superior of bone carbonizer, but for ordinary purposes bone is quite satisfactory.

The reason for this discrimination between ordinary work and delicate case hardening is based on scientific principles. The writer has found through his own experience that a carbon content in the case of 0.85 per cent gives the very best results for a hard, stiff case that will neither wear away easily nor chip off under a slight blow. Of course it is quite impossible to secure such a distinctly theoretical carbon content in your case, but anywhere from 0.85 to 1 per cent carbon in the case will give remarkable results if properly heat treated. A closer adherence to this range is secured by using the balanced compounds of the carbonizer manufacturers rather than by indiscriminately using natural carbonizers. However, for the most part, the fortified bone will give very good results and it is much more economical.

Antimony and the War

The consumption of antimony in this country and Canada is estimated to amount at present to 600 to 700 tons per month, which is about the consumption in this country alone in peace times. Regular domestic consumption is now probably not over 50 per cent of normal, owing to the high price of the metal.

Imports of the metal and regulus for July, 1915, were 2,439,601 lb., as against only 856,653 lb. in July, 1914. Before the war about half the antimony was imported from Europe, but now it all comes from Japan and China, indicating the tremendous expansion there. These countries are also exporting to England.

American antimony is now appearing on the domestic market, the production being estimated at the rate of 100 to 150 tons per month, and it is claimed to be superior to the Chinese or Japanese.

The Lavigne Gear Company, Racine, Wis., manufacturing steering gears for automobiles and similar purposes, has been reorganized under the name of Lavigne Gear Company. The change in name is made for the sake of simplicity. The officers of the company now are: President and treasurer, Herman A. Uhlein, Milwaukee; vice-president, P. B. Wohlrab, former production manager of the Lozier Motor Car Company and former master mechanic of the Maryland Steel Company; secretary, D. L. Robertson, formerly with Crerar, Adams & Co., Chicago; sales and advertising manager, E. M. McCaskey, former engineering sales manager of S. F. Bowser & Co. Important extensions are being made in the plant to accommodate a greatly increased demand, both domestic and foreign. The company is considered the second largest manufacturer of steering gears in the world.

Newark, N. J., has reclaimed 170 acres of the meadows between that city and Newark Bay for manufacturing sites of an average of 10 acres per plot. A channel 20 ft. deep and 400 ft. wide has been dredged to connect the site with tidewater and the ocean and the present plan comprehends deepening the channel as the development continues, as in all 1100 acres are available for reclamation. It appears that below the silt and underlying sand there is hard pan at a depth of approximately 12 ft. The Port Newark Terminal, as it is known, is also adjacent to trunk railroad lines.

A new design high duty Q.M.S. cold metal saw is to be put on the market in about a month by the Vulcan Engineering Sales Company, Elston Avenue, Chicago. The machine is arranged to provide for a variable peripheral speed of the saw blade and a variable feed.

SYSTEM AND ITS ABUSE*

Danger that Scientific Method Becomes Master and Not the Servant

BY JOHN CALDER

We organize in order to *manage* a business under-taking and we *manage* it through *system*.

It is a weakness in any business if the responsible executives are unable to give on demand a satisfactory account of how it is supposed to function, and we owe a debt of gratitude to those who, during the last decade, have brought to the front the issue that we must always know clearly three things, viz., whom we have to co-operate with, what we have to manage, and how we are supposed to accomplish the work. This knowledge, in proportion, should reach down to the performer of the humblest tasks. It may be accepted as a general rule that proper selection and instruction of the human factors in organization and management will lead sooner or later to a systematic functioning which will be a natural outgrowth of the needs of the business, while unvitalized red tape will always prove ineffective.

NO PINK PILL FOR PALE PLANTS

There is no magic about system, no matter whose name may be attached to it. It is no pink pill for pale plants. System is simply organized common sense. If a system for anything is so involved that its material elements cannot be easily comprehended, have nothing to do with it.

Set it before you as an axiom that no system is worth any more than it can earn. There are systems of doing things in certain plants to-day which are most ingenious and interesting and yet undesirable from the point of view of profit making. There are systems constructed with rejoicing and lax scrutiny in the years of plenty which are to-day eating off their heads because they have no reducing expense of operation for lean times.

The first question which the experienced investigator usually puts, to himself at least, after all the facts are on the table is not what systems did they have or not have, but "Is the business worth while anyhow?" This is no idle question either. Not a few systematizers have labored valiantly over plants and made sincere promises of betterment which were wholly negatived on the balance sheets because the businesses, irrespective of the systems in use, were inherently unprofitable ventures and could have been readily classified as such with a fraction of the energy spent in spinning the web of a new system around them.

REACTION AGAINST SYSTEMATIZING NEEDS CHECKING

On the whole the tendency has been to over-elaborate detail without regard to its profit-making utility in the premises; to construct ornament rather than to ornament construction; to design systems on expensive foundations strong enough to carry a great deal of business that does not exist and never will exist. A decided reaction is now setting in which should not be allowed to go too far. Too few people realize to-day on what remarkably small margins many businesses which prosper slowly are carried and could not stand the infliction of new, elaborate and costly plans of operation which guarantee no expansion of trade to justify them.

LIMIT TO APPLICATION OF SCIENTIFIC MANAGEMENT

Undoubtedly we have gained much ground, particularly in specific details of system, but we have also at times been unable to see the forest because of the trees. Take, for instance, the system known as scientific management, which will remain as a monument to its gifted founder. This system has very broad and exclusive claims and insistent detail. It is the best articulated of all the competing systems of business oversight, but it is not the most effective and economical scheme for solv-

ing a number of business and industrial problems on which it has been tried. Nor was a trial at all necessary to prove this, and scientific management has suffered because its limitations have not been recognized and its costly functionalization thrust upon small irregular industries not able to take full advantage of it.

In many of our businesses to-day the margin of profit is so small, the labor items so low a factor in the total cost and the work of a few practical executives so economical that it would be folly to inflict upon them in the name of science a more expensive and less efficient routine. Exponents of scientific management have been known to hold that such businesses are inherently weak and should not exist; but science implies action in accordance with the facts, and no system should be permitted to be an end in itself, but should submit at all times to the commercial test of profitableness.

THE REMEDY FOR UNWISE SYSTEMATIZING

Now what is the remedy for unwise systematizing? It is twofold. First, while holding the chief executive of a business wholly responsible for permitting momentous changes in system it is always wise to give his subordinates a chance to offer suggestions on a given plan of outside origin. If this is done the proprietors will be surprised at the number of things they assume about their business which are not so. A passion for facts should override all other considerations, even our most cherished ideas of system detail. The professional systematizer is not guiltless, for, having obtained the ear of the proprietor of a business he has sometimes ridden roughshod over the experienced executives, alienated their support, and pulled up finally a goodly distance along the wrong road to the ultimate discrediting of perfectly sound ideas propagated unfortunately by injudicious and unmannerly agents.

The second aid to correct perspective in applying system is a sound apprehension of what the scientific method essentially is and of its possibilities and relation to the varying factors of business, which is an art rather than a science. At the request of the Committee on Administration of the American Society of Mechanical Engineers three years ago I defined the scope of the scientific method in business as "the critical observation, accurate description, analysis and classification of all industrial and business phenomena of a recurring nature, including all forms of co-operative effort, and the systematic application of the resulting records to secure the most economical and efficient production and regulation of future phenomena."

The ability clearly to perceive and avoid inutility in such research is frequently absent in men who are permitted to systematize without thorough business experience. In all such cases wise, capable managements will save time and money by avoiding any attempts to establish a science for irreconcilable variables or infrequent phenomena and will fall back upon an empirical but none the less "common-sense" solution of the problem. This necessity does not reflect upon the scientific method, which must always face very different conditions in industry and commerce from those met with in nature, and must constantly yield to and be measured solely by considerations of ultimate utility, of available capital and of current product and profit.

HITTING HIGH SPOTS OF INEFFICIENCY

In conclusion let me point out that in facing the actual problems of industry with full appreciation of what the scientific method might accomplish under certain conditions it is not as a rule necessary or advisable to go into minute details before systematizing actively to some extent. A very comprehensive system takes much time and money to formulate and is rarely born made to order. The responsible executive is called upon to produce rather than to ponder, and if he is wise he will hit the high spots of inefficiency and lack of system at relatively low cost and without delay, leaving the refinements to a later date and probably postponing some of them indefinitely.

The law of diminishing returns will soon begin to operate unmistakably, and the point of maximum economy

*From a paper read before the Efficiency Society, Lake Placid Club, Lake Placid, N. Y., Sept. 17. The author is president of the Manufacturers Equipment Company, Boston.

will be reached before the ingenuity of an ardent systematizer is exhausted. The same considerations apply to the multiplication of useless records in production, costing and accounting. It is well to be wise after the fact, but if the enlightenment is too long delayed the cost of procuring it is out of proportion to its value. One of our most noted engineering experts retained to investigate a well-known business declared that it appeared to him as if the man who had designed the recording systems of the plants must have had a personal interest in some stationery concern.

There are other benefits than economy and efficiency from the judicious systematizing attempted in modern business and industry during the last ten years. There is nothing so pleasing to an employee as to stimulate a mental interest in his daily work, and this the wise practice of the scientific method always does. The persistent concern for the why and how of business conduct has lifted many a task from the level of dead routine and drudgery to an intellectual plane. There is a growing company who look to the earnest cultivation of the intellectual life as the saving and leavening power of our western civilization and of its institutions. It is fed from many sources, and more and more in all our human relations it is sure that no matter who may seem to rule in the nation the thinker is and always will be our master.

Brass Furnaces Conveniently Arranged

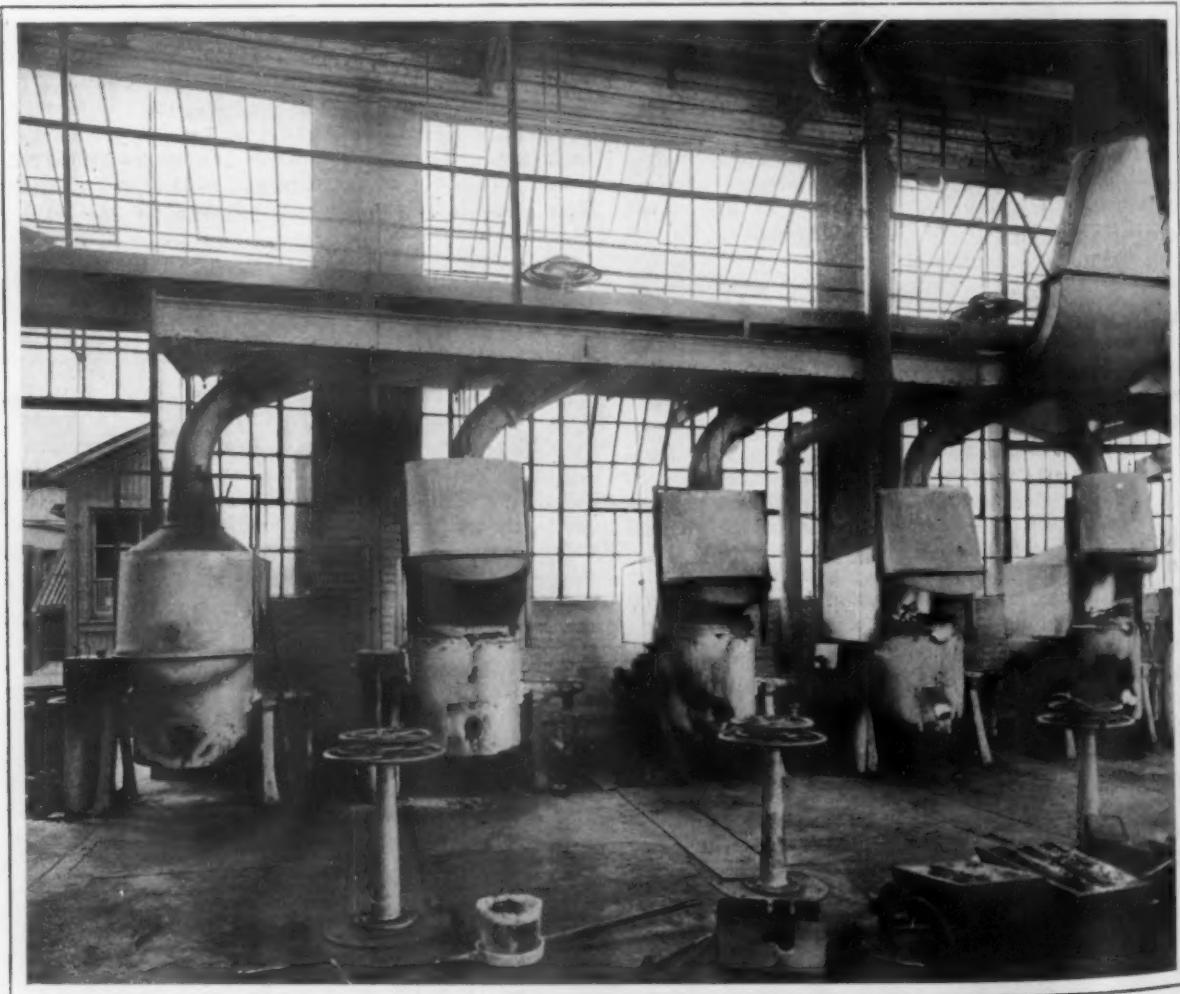
A battery of five, gas-burning, brass furnaces installed in the foundry of the Ford Motor Company is interesting in connection with the arrangement for the remote control of the furnace operation and the system installed for drawing off the gases from the furnace crucible. From the handwheel stand shown in front of the furnaces, the operator has control of the gas pressure and the tilting of the furnace so that the difficulties attendant upon handling the crucibles in and

out of the furnace at high temperatures are avoided. The exhaust hoods are counterbalanced and may be raised or lowered from a distance several paces in front of the furnaces.

Steam Generation from Waste Heat of Kilns

Thomas A. Edison has been granted a patent (U. S. 1,148,832—Aug. 3, 1915) for a method of utilizing the heat of gases escaping from rotary kilns, for the generation of steam. Attention is directed to the prevention of trouble due to the dust in such gases and to the prevention of interference with the draft of the kiln. The invention is based on the observation that the problem of the nondisturbance of the draft of the kiln is only susceptible of solution by the generation of a constant quantity of steam, regardless of the consumption of the engine or whether this is running at all. The quantity of steam generated is somewhat greater than the maximum amount to be used by the engine, the remainder escaping through a safety valve. It is stated that the engine could be furnished with 85 to 90 per cent of the steam generated without endangering the draft of the kiln.

The Workmen's Compensation Board and the State Insurance Fund Board—the two organizations which will carry out the provisions of the new compensation and State insurance laws in Pennsylvania—were permanently organized at a recent meeting in Harrisburg. Harry A. Mackey of Philadelphia, was selected chairman of the compensation board and State Treasurer Young was made chairman of the insurance board. It was decided that the State should be divided into eight districts for the administration of the compensation law. Both boards will have their headquarters in the Masonic Temple, Harrisburg, Pa. The new acts become effective Jan. 1.



A Battery of Five Gas-Burning Brass Furnaces Arranged for Remote Control from the Handwheels in the Foreground

Shells of the Calibers Now in Service

Comprehensive Information for Those Contemplating Munitions Manufacture—Sizes of Projectiles Used by the Nations of the World

BY C. A. TUPPER*

In the production of war munitions, one practical question with which manufacturers have been concerned is the working range of the equipment which it will be desirable for them to provide, having in view possible future requirements. In this the calibers of the shells likely to be in greatest demand by the various belligerent nations cuts a very considerable figure. At first the call was for 2.95 and 3-in. shrapnel; then in rapid succession for 3.29, 4.5, 4.72, 5.87 and 6-in. high-explosive shells, and finally for the larger sizes, including 9.2, 9.45, 12 and 14-in. projectiles.

In the minds of manufacturers who contemplate going into this work or increasing their facilities for it the questions naturally arise as to what is the total of the shell calibers in actual service; what does the exact diameter of each measure; which are the most commonly used, and how are they distributed among the various nations, both those now at war and others that may be involved? The question of which calibers were designed in inches and which in millimeters also has a more important bearing than might be imagined by the casual thinker.

The tables accompanying this article show the calibers of the ordnance and consequently of the shells used with it. They comprise the shells for all classes—field, naval, coast-defense and even anti-aerial guns, in use to-day by the leading nations of the world. As a matter of convenience all figures below the heading have been reduced to an inch basis for purpose of comparison. The inch measurement, however, applies strictly and invariably only to ordnance used by England and the United States. The artillery and ammunition of other countries is figured in millimeters, except where it has been supplied by English or American ordnance works in accordance with their own standards. The larger metric calibers are also commonly designated by centimeters; but here again, for uniformity and convenient reference, all metric dimensions stated in this article are given in millimeters. Other information supplementary to the tables follows:

THE GERMAN HOWITZERS

While an 18-in. gun for coast defence has been designed in this country and shows in a list prepared by the Bethlehem Steel Company, the largest pieces of artillery thus far subjected to the actual test of warfare are those turned out at the Krupp works in Essen, Germany, and the Skoda works of Pilsen, Austria. These take shells 420 mm. and 405 mm. in base diameter. The bore of the former slightly exceeds 16.5 in., and the latter is a little under 16 in. Thus far the use of such ordnance on European battlefields has been confined to howitzers in the service of the central powers; hence, as the latter are compelled by the sea blockade of the entente powers or "allies" to rely entirely upon their own arsenals, there is no present likelihood that American works will be required to turn out 420 or 405-mm. shells. Nor is there any information available regarding the weights of the high-explosive

projectiles used with the howitzers of those calibers. The nearest equivalent known to American ordnance experts, the 16-in. shell for coast defense artillery, has a weight of approximately 2100 lb. A Krupp gun of the same class (405 mm.) for land batteries calls for a hardened cap projectile weighing 2028 lb. (920 kg.), with a firing charge of 555 to 624 lb. (252 to 283 kg.), according to the range required. Fragments of the German and Austrian howitzer shells secured on Belgian, French and Russian battlefields show the same special construction as that of the 320 mm. or 14.96-in. shell next referred to.

It was howitzers of the 380-mm. bore which bombarded Dunkirk from a distance estimated to be over 20 miles. The shells from these, as well as from the 420 and 405-mm. guns, have two copper driving bands and a front steady band of the same material. For naval service the Germans have placed 380-mm. guns on the latest super-dreadnaughts of the Ersatz Worth class. Ordnance of identical size is in use by Italy and has also been developed by France, while the Armstrong works in England have produced an equivalent in the 15-in. gun. For naval work this appears in the primary battery of the Queen Elizabeth operating at the Dardanelles, as well as in sister ships, which were not completed until after the outbreak of the war. The weight of the standard 380-mm. shell is 1675 lb. (760 kg.), with a driving charge of 456 to 694 lb., while the 15-in. shell varies somewhat either way from 1700 lb. The German 14.5-in. gun (370 mm.) was not a success. A 13.5-in. gun has been designed but is not in use. The French 340-mm. gun, equal to 13.35 in., is an odd size which has seen little service, while another that belongs in the same category is the 12.5-in. gun used by Japan.

SHELLS FOR THE 12-IN. GUN

Shells to fit the 12-in. gun, for many years the standard maximum caliber for the turret armament of battleships of the pre-dreadnaught class, are required by all of the leading nations of the world and by some of the minor powers. For guns manufactured in England and the United States the diameter of the shell is exactly 12 in. In France, Germany, Italy, Spain and other metric scale countries having ordnance works, it is figured as 305 mm. The projectiles for the 12-in. gun and its equivalent vary a great deal in weight, according to length and composition. They range all the way from 772 to 981 lb., the nearest approach to a standard being that set by the Krupps at 860 lb. (390 kg.) and the American 870-lb. shell. Driving charges weigh from 213 to 357 lb.

The so-called 11-in. caliber is really the 280-mm. (11.02-in.) originating with the Krupps and patterned after them by the Skodawerke. It is used principally by Germany and some of the lesser powers which have ordered Krupp ordnance. The Austrians have not taken to it to any great extent. There is no technical objection to this caliber, but guns designed for it have been found of little effect when opposed to the 12-in. size, and the widespread adoption of the latter "killed" it. For German naval

*Consulting engineer, Chicago.

service it was installed on the first dreadnaughts, of the Nassau class, but succeeding dreadnaughts were equipped with 305-mm. guns. The 280-mm. Krupp shell weighs 661 lb. (300 kg.), while others of the same caliber vary between 505 and 761 lb. Driving charges weigh 164 to 275 lb.

France has developed the 275 and 270-mm. Creusot works guns, whose calibers are slightly larger than 10.8 and 10.6 in. respectively. For naval service these sizes are open to the same objection as the 11.02 in., i.e., the preponderance of the 12-in., and other nations have not followed the French lead. For field guns, however, the French seem to have found advantages in the 270-mm. (10.63-in.) caliber, and it is playing a considerable part in offensive action on the central Western front.

An Austrian gun of which much has not been heard—in fact, practically nothing outside of that country—is the 260-mm. (10.24-in.) caliber manufactured at the Skodawerke. The only shell used with this on which the writer has any figures weighs 572 lb. (260 kg.), and the driving charges are given as 141 to 184 lb. The base of a 260-mm. shell picked up within the Italian lines west of the Isonzo front, however, indicated a somewhat heavier projectile,

range of shells fired from the 240-mm. gun may be considerable.

England, which started to develop a 9-in. gun and made deliveries of Armstrong (Genoa) ordnance of that caliber to Italy, compromised on the 9.2-in. (233.7-mm.) size, and still adheres to it as a standard, despite the manifest advantages in this war of interchangeability with French ordnance and ammunition. For naval purposes the United States is abandoning that size. Some were formerly used, but they were worked off on Greece with the sale of two battleships, and will be a source of future worry to that nation in providing shells for them.

A German gun which has come under the same ban as the English 9 in. is the 210-mm. (8.27-in.) size. It was principally manufactured, with its shells, for Denmark and Norway, and bought by them, one is inclined to suspect, because the ordnance could be had at a bargain. It has also a Befors rating. The weight of shells used with it are 249 to 309 lb., with driving charges of 68 to 84 lb.

THE AMERICAN 8-IN. CALIBER

Enumeration of the above brings us to the dis-

Calibers originally designed in millimeters	Table of Medium to Light Gun Calibers Used by Various Nations														140		
	130	120	..	105	..	100	88	85	..	77	75	70	65	57	47	37	
Exact metric equivalents of calibers designed in inches	127	119.3	114.3	..	101.6	..	..	..	..	83.5	76.2	..	..	..	..	..
Equivalents in inches of metric calibers	5.51	..	4.72	..	4.14	..	3.9	3.43	3.31	..	3.03	2.95	2.75	2.56	2.24	1.85	1.46
Calibers designed in inches	..	5	4.7	4.5	..	4.	..	..	..	3.29	3	..	..	..	..	..	..
Germany	..	5.1	4.7	..	4.1	..	..	3.43	3.31	..	(3.03)	2.95	2.75	2.56	2.24	1.85	1.46
France	..	5.1	4.7	..	4.1	..	3.9	..	3.31	..	2.95	..	..	..	..	..	..
England	..	4.7	4.5	..	4	..	..	3.43	3.31	3.29	3	..	2.75	..	..	..	..
Russia	..	5.1	4.7	4.5	4.1	..	..	3.43	3.31	3.29	3	2.95	..	2.56	..	..	..
Austria	..	5.1	4.7	..	4.1	..	3.9	3.43	3.31	..	(3.03)	2.95	2.75	2.56	..	..	..
United States	..	5	4.7	4.5	..	4	..	3.8	..	..	3	2.95	2.75	..	..	..	..
Japan	..	4.7	4.5	..	..	..	3.9	3.43	..	3.29	3	2.95	..	2.56	..	..	..
Italy	..	4.7	..	..	..	..	3.9	..	3.31	..	..	2.95	..	..	..	..	..
Sweden	..	5.1	4.7	..	4.1	..	..	3.43	..	..	2.95	..	..	2.56	..	..	..
Holland	..	4.7	..	..	4.1	..	..	..	3.31	..	..	2.95	..	2.56	..	..	..
Denmark	..	4.7	..	..	4.1	..	..	3.43	..	..	2.95	..	..	..	..	..	..
Norway	..	4.7	..	..	4.1	..	..	3.43	..	..	3	2.95	..	..	..	..	..
Greece	..	4.7	..	..	4.1	4	..	..	..	..	..	2.95	..	..	..	..	..
Roumania	..	5.5	4.7	..	4.1	..	3.9	..	3.31	..	..	2.95	..	..	..	..	..
Bulgaria	..	5.1	4.7	..	4.1	..	..	3.43	..	..	2.95	..	..	2.56	..	..	..
Serbia	..	4.7	4.5	..	4.1	..	..	3.43	3.31	..	..	2.95	..	..	..	..	..
Turkey	..	5.1	4.7	..	4.1	4	..	3.43	..	..	2.95	..	..	2.56	..	..	..
Spain	..	4.7	..	..	4.1	..	..	..	3.31	..	..	2.95	..	..	..	..	..
Portugal	..	4.7	..	..	4.1	..	..	..	..	..	..	2.95	..	..	..	..	..
Argentina	..	4.7	..	..	4	..	..	..	..	3	..	..	..	..	..	..	..
Brazil	..	4.7	..	..	4.1	..	..	3.43	..	..	2.95	..	..	2.56	..	..	..
Chile	..	5	4.7	..	4.1	..	..	3.43	..	..	2.95	..	..	2.56	..	..	..
China	..	4.7	..	..	4	..	..	..	..	3	..	..	..	2.56	..	..	..

and the range would tend to show a greater driving charge than even the maximum above named.

THE 10-IN. GUN

The 10-in. shell represents a size confined almost entirely to English and American practice, although Italy and the Argentine Republic have purchased Armstrong guns of that caliber. It is also listed in Befors tables as the 254-mm. gun, taking a shell weighing 441 to 564 lb., with a driving charge of 123 to 153 lb.

The 250-mm. or 9.84-in. caliber appears to have been adopted in Sweden only. An armor-piercing naval projectile used for guns of this size weighs 462 lb. (210 kg.), with driving charges of 94 to 127 lb.

A caliber designed as 240 mm., or 9.45 in., is one which has been very generally adopted outside of the United States, England, Russia and Japan. Austria, besides using that caliber largely, has tried the 235-mm. or 9.25-in. gun. Projectiles for the former weigh 375 to 474 lb., with usual firing charges of 103 to 129 lb. The Krupp standard is 419 lb. (190 kg.), with a firing charge of 113 to 173 lb. The last-named maximum indicates that the comparative

tinctively American 8-in. caliber, which has been tentatively copied in some foreign countries as the slightly larger 205-mm. size. While widely scattered over the earth, however, as the result of sales made from this country, the aggregate tonnage of shells which can be fired from guns of the 8-in. caliber cannot be very considerable; and, outside of Russia, which has been supplied with some 8-in. shells from Japan, it is playing practically no part in the European war. The standard Bethlehem 8-in. shell weighs 260 lb.

Next in order are the 7.6-in. gun and the slightly larger 194-195-mm. (howitzer) of France, the English 7.5-in. gun and the 190-mm. or 7.4-in. German auto-carriage rifle. Of these the 194-mm. size has been most widely adopted. It takes a shell weighing 198 to 251 lb., with driving charges approximating 55 to 68 lb. For the 190-mm. caliber the weight of the shell, Krupp standard, is a trifle under 210 lb. (95 kg.), with driving charges of 65 to 88 lb.

The 7-in. caliber, whose standard shell weight is 165 lb., seems to be peculiarly American, while two other odd sizes are the German 170-mm. (6.7-in.), which calls for a shell weighing 154 lb. (70 kg.) impelled by a charge of 48 to 63 lb., and the French

These three light gun calibers, generally known as 6.3 and 10-pdr., practically universal in size and time.

Table of Heavy to Medium Calibers Used by Various Nations

	250	240	235	210	195	190	170	165	150
Calibers originally designed in millimeters	250	240	235	210	195	190	170	165	150
Exact metric equivalents of calibers designed in inches	233.7	228.6	203.2	193	190.5	177.8	152.4	150	150
Equivalents in inches of metric calibers	9.84	9.45	9.25	8.27	7.68	7.48	6.7	6.5	5.91
Calibers designed in inches	9.84	9.45	9.25	8.27	7.68	7.48	6.7	6.5	5.91
Germany	9.4	9.4	9.4	8.3	7.5	7.5	6.7	6.5	5.9
France	9.4	9.4	9.2	8	7.6	7.5	6.7	6.5	5.9
England	9.4	9.4	9.2	8	7.6	7.5	6.7	6.5	5.9
Russia	9.4	9.25	9.25	8	7.6	7.5	6.7	6.5	5.9
Austria	9.4	9.25	9.25	8	7.6	7.5	6.7	6.5	5.9
United States	9.4	9.2	9	8	7.6	7.5	6.7	6.5	5.9
Japan	9.4	9.2	9	8	7.6	7.5	6.7	6.5	5.9
Italy	9.4	9.2	9	8	7.6	7.5	6.7	6.5	5.9
Sweden	9.8	9.4	9.2	8.3	7.5	7.5	6.7	6.5	5.9
Holland	9.4	9.4	9.2	8.3	7.6	7.5	6.7	6.5	5.9
Denmark	9.4	9.4	9.2	8.3	7.6	7.5	6.7	6.5	5.9
Norway	9.4	9.4	9.2	8.3	7.6	7.5	6.7	6.5	5.9
Greece	9.4	9.4	9.2	8.3	7.6	7.5	6.7	6.5	5.9
Roumania	9.4	9.4	9.2	8.3	7.6	7.5	6.7	6.5	5.9
Bulgaria	9.4	9.4	9.2	8.3	7.6	7.5	6.7	6.5	5.9
Serbia	9.4	9.4	9.2	8.3	7.6	7.5	6.7	6.5	5.9
Turkey	9.4	9.4	9.2	8.3	7.6	7.5	6.7	6.5	5.9
Spain	9.4	9.4	9.2	8	7.6	7.5	6.7	6.5	5.9
Portugal	9.4	9.4	9.2	8	7.6	7.5	6.7	6.5	5.9
Argentina	9.4	9.4	9.2	8	7.6	7.5	6.7	6.5	5.9
Brazil	9.4	9.4	9.2	8	7.6	7.5	6.7	6.5	5.9
Chile	9.4	9.4	9.2	8	7.6	7.5	6.7	6.5	5.9
China	9.4	9.4	9.2	8	7.6	7.5	6.7	6.5	5.9

*See text.

165-mm. (6.5-in.) gun which uses elongated projectiles almost as heavy.

THE MEDIUM CALIBER MOST GENERAL

We now come to the ordnance which, of all the medium calibers, is the most generally used and ought to be taken into particular account when planning facilities for the manufacture of ordnance or ammunition, viz., the 6-in. English and American gun and the 150-mm. artillery of other nations, both being used as field pieces and for naval guns. Any shop manager who provides equipment for turning out 6-in. shells or their metric equivalents can always be certain of a demand for them as long as any buying is being done by the belligerents. Weights of 6-in. shells range between 90 and 115 lb., with driving charges of 24 to 35 lb. The American standard for the projectile alone is 105 lb. Shells of 150-mm. (5.9-in.) Krupp standard weigh 101 to 112 lb. (46 to 51 kg.) and require driving charges of 32 to 40 lb.

Between the ordnance last named and the American 5-in. gun which, with the British 4.5-in., will probably pass into the discard after this war, are the French 140 and 130-mm. (5.5 and 5.1-in.) sizes. These will undoubtedly be abandoned also, as they are practically out of use now.

The first size below 6 in. which seems to have come to stay is the French and German 120-mm. or

4.72-in. caliber, that has been adopted by nearly all important nations. Shells used with guns of this size range in weight between 43 and 62 lb. (24 to 27 kg.). Driving charges are from 13 to 22 lb.

Before settling on the 120-mm. caliber as a field piece and naval standard, the Krupps and the Creusot works developed the 105-mm. or 4.14-in. size, and guns of this class were also largely turned out by the Skodawerke; but Germany, Austria and France do not appear to be using them to any extent now, and their future service in war will probably be confined to the smaller nations who were unfortunate enough to purchase them. The weights of the shells used with 105-mm. field pieces vary between 31 and 40 lb. (14 to 18 kg.) and their impelling charges call for 9 to 15 lb.

What has been said of the 120-mm. caliber also applies to the English and American 4-in. gun and the French and Austrian 100-mm. or 3.9-in. cannon, also the German 88-mm. (3.46-in.) ordnance, although so many of all of these were originally provided that the percentage still in use is considerable. Shells manufactured for the sizes mentioned range in weight between 29 and 35 lb. as standards, but actual field service conditions have made any figures unreliable, as the tendency has been to use just as heavy shells as the guns would possibly take, in order to get service out of them approximating the

Table of Heavy Calibers Used by Various Nations

	405	380	370	355	340	330	305	280	275	270	260	254
Calibers originally designed in millimeters	405	380	370	355	340	330	305	280	275	270	260	254
Exact metric equivalents of calibers designed in inches	406.4	381	355.6	342.9	330.2	317.5	304.8	279.6	270	260	254	254
Equivalents in inches of metric calibers	15.93	14.96	14.57	13.98	13.35	12.01	11.02	10.83	10.63	10.24	10	10
Calibers designed in inches	16.5	16	15	14	13.5	13	12.5	12	11	10	10	10
Germany	16.5	16	15	14.5	14	Not in use	12	11	10.8	10.6	10	10
France	15	14	14	13.5	12.5	12	11	10.8	10.6	10.4	10	10
England	15	14	14	13.5	12.5	12	11	10.8	10.6	10.4	10	10
Russia	14	14	14	13.5	12.5	12	11	10.8	10.6	10.4	10	10
Austria	16.5	16	15	14	13	12	11	10.8	10.6	10.4	10	10
United States	16.5	16	15	14	13	12.5	12	11	10.8	10.6	10.4	10
Japan	15	14	14	13.5	12.5	12	11	10.8	10.6	10.4	10	10
Italy	15	14	14	13.5	12.5	12	11	10.8	10.6	10.4	10	10
Sweden	15	14	14	13.5	12.5	12	11	10.8	10.6	10.4	10	10
Holland	15	14	14	13.5	12.5	12	11	10.8	10.6	10.4	10	10
Denmark	15	14	14	13.5	12.5	12	11	10.8	10.6	10.4	10	10
Norway	15	14	14	13.5	12.5	12	11	10.8	10.6	10.4	10	10
Greece	15	14	14	13.5	12.5	12	11	10.8	10.6	10.4	10	10
Roumania	15	14	14	13.5	12.5	12	11	10.8	10.6	10.4	10	10
Bulgaria	15	14	14	13.5	12.5	12	11	10.8	10.6	10.4	10	10
Serbia	15	14	14	13.5	12.5	12	11	10.8	10.6	10.4	10	10
Turkey	15	14	14	13.5	12.5	12	11	10.8	10.6	10.4	10	10
Spain	14.5	14	14	13.5	12.5	12	11	10.8	10.6	10.4	10	10
Portugal	14	14	14	13.5	12.5	12	11	10.8	10.6	10.4	10	10
Argentina	14	14	14	13.5	12.5	12	11	10.8	10.6	10.4	10	10
Brazil	14	14	14	13.5	12.5	12	11	10.8	10.6	10.4	10	10
Chile	14	14	14	13.5	12.5	12	11	10.8	10.6	10.4	10	10
China	14	14	14	13.5	12.5	12	11	10.8	10.6	10.4	10	10

4.7-in. calibers with which they are being replaced. Shells picked up on European battlefields and brought to this continent show by the condition of the copper driving bands that the rifling of these odd-size guns has been badly worn, also that they are being utilized to a considerable extent for shrapnel, which is generally confined to calibers between 75 and 88 mm. (2.95 to 3.46 in.). Shrapnel cases are, however, also fired from 150 and 120-mm. (5.91 and 4.72-in.) guns.

THE 3-IN. CALIBERS

The most widely used caliber below the 120 mm. is the French and German 85 mm. (3.31 in.), which reappears as the English 3.29-in. size. Then comes the celebrated French 75-mm. (2.95-in.), also in use by other metric scale nations, and the English and American 3-in. gun whose caliber is the equivalent of 76.2 mm. A German size is 77 mm., as well as 75 mm. The tendency at present seems to be to retain this size (2.95, 3 or 3.03 in.) for shrapnel, but to use high explosive shells of the larger caliber mainly, and the 85-mm. will probably be adopted altogether for small shells of that type unless superseded by the new 90-mm., which has yet to be brought into service. Meanwhile, the French have extended the usefulness of the 75-mm. caliber by developing at the Creusot works trench mortars of that size. These will take the same shell as that used for the field piece, thus overcoming one difficulty experienced with the latter, whose trajectory is so low that dropping shells into a nearby trench of the enemy has often been found impracticable.

At this point it should be noted that guns of 3 in. or under are ordinarily chambered for fixed ammunition, the projectiles used with them being each fitted with a brass cartridge case containing the driving charge. Ordnance from 3 to 6 in. is similarly designed, particularly the 4.72-in., or can be chambered for loose charges, with the powder in bags or cases separate from the projectile. Guns above 6 in. are usually chambered for loose ammunition only.

Below the 75-mm. caliber are the 70-mm., 65-mm., 57-mm., 47-mm. and 37-mm. The three last named are in practically universal service, being known to the English and to Americans as 6-pounders, 3-pounders and 1-pounders. Their sizes figured in inches will be seen from the table. These find their greatest sphere of usefulness as rapid-fire naval guns. Shells for them are manufactured in government arsenals and the conditions of the European war have not called for any great supply, nor do they seem likely to. Actual service with them has been principally confined to patrol vessels equipped to hunt down submarines.

THE ANTI-AIRCRAFT GUNS

A more interesting and important development has been the relatively large production of guns and shells for defense against air-craft. They are known as "anti-aerials." Of these the Krupp works manufacture six standard sizes, whose calibers are equivalent to 5.91, 4.72, 4.14, 3.43, 2.95 and 2.76 in. The weights of the shells used with them, including cartridge cases and driving charges, are 101 lb. (46 kg.), 53 lb. (24 kg.), 34 lb. (15.5 kg.), 21 lb. (9.5 kg.), 13 to 14.3 lb. (5.8 to 6.5 kg.) and 11 lb. (5 kg.), respectively. All of these will take shrapnel, and high-explosive shells are also used in the larger sizes. Similar guns and shells have been turned out by the Rheinische Metallwaaren & Maschinenfabrik (Ehrhardt) of Duesseldorf, Germany; by the Skodawerke in Austria and at the Genoa and Spezzia arsenals of Italy. In France, England and

for Russian account similar provision has been made, but concerning the anti-aerials of these nations the writer has no definite figures.

PENETRATING POWER REQUIRED

For all of the shells above enumerated an invariable requirement is a certain standard of penetrating power or "perforation," which reaches the manufacturer translated into terms of hardness, toughness, etc., shown by physical and chemical analyses. To the ordnance expert, however, this is expressed as muzzle energy and velocity and the penetration of wrought iron or soft steel plate according to De Marres', Gavre's or Tresidder's formulæ. For armor-piercing projectiles the penetration test is made on Krupp armor steel or its equivalent by the Krupp, Ehrhardt or Davis formulæ. In comparing muzzle penetration tests on iron and steel not hardened, 1 in. thickness of steel is taken as the equivalent of 1 1/4 in. of iron, so that 10 in. penetration of iron plate would equal 8 in. through steel, and vice versa.

Other features of artillery rating which affect shell manufacture aside from caliber and penetration are the length of gun bore, total length of the piece, weight of the gun mounted and interior measurements which include the dimensions of the rifled section, powder chamber, etc., as well as the number of rifling grooves and twist in calibers. Muzzle energy is expressed either in meter-tons or foot-tons. One meter-ton (dinamode) is equivalent to 3.2291 foot-tons, and conversely 1 foot-ton equals 0.3097 meter-ton.

To take up all of these factors, in connection with the present article, will hardly be practicable; but the above will give an idea of the present range of shell production. The present war has demonstrated that there are in use to-day many more calibers than have been found either necessary or desirable; so that a natural process of selection will bring about their reduction to a few effective standards. Among these the calibers which seem most likely to survive are those which approximate 1.85, 2.24, 3, 4.7, 6, 7.6, 9.45, 12, 15 and 16.5 in. Meanwhile, however, there will be considerable demand still for the 4.5 and 9.2-in. sizes and a limited need for 14-in. and other shells used for naval service.

The information contained in this article and the accompanying tables has been gathered by the writer gradually and over a considerable period of time beginning with notes made in Europe before the war in connection with gun lathe work. As an outline it is probably more comprehensive than will be found anywhere outside of army and navy bureaus and established ordnance plants. If, however, any reader of THE IRON AGE observes errors or omissions of importance, this is a good time to call attention to them, as the country needs all the information it can get on munitions manufacture. In respect to ordnance designed for use by the United States the list printed herewith is admittedly incomplete; but on that particular subject some reticence is probably desirable. American Army and Navy authorities are competent and prepared to a far greater degree than they seem to be given credit for and what they wish to have manufacturers in this country know regarding American ordnance will probably be brought to their attention in due course by the proper officials. Meanwhile, the exact scope of foreign requirements has its lesson for us.

India produced 14,086 metric tons of magnesite in 1913 and 5676 tons of chrome ore as well as 1688 tons of tungsten ore. The iron-ore output was 370,845 tons, according to the Geological Survey of India.

ATOMIZING FUEL OIL*

Superheated Steam Found Better Than Air in Open-Hearth Furnace Tests

The Committee on Steel Foundry Standards of the American Foundrymen's Association undertook during the past year an investigation into the relative advantages and disadvantages of atomizing fuel oil with steam and with air in basic open-hearth steel furnaces to determine which of the two agents is preferable from every standpoint, including cost, time, quality of product, etc., both in basic and in acid practice.

BASIC TESTS AND THE FURNACE

The tests were begun Mar. 29, 1915, at the plant of the Commonwealth Steel Company, Granite City, Ill., on an open-hearth furnace having a magnesite bottom, the bath of this furnace at the slag line being 24 ft. 4 in. x 9 ft. 6 in. in area, and 21 in. deep at the center, 2 ft. back of the tap hole. The furnace at the time of the tests was receiving initial charges of pig iron and scrap amounting to 56,000 lb. The exact time for beginning the tests was purposely regulated by the condition of the furnace, on which test operations were begun when it was in perfect, normal condition, in the middle of its campaign. It had made 275 heats since the last general repairs. The furnace presented no extraordinary details of construction from those usually found in steel foundries, and had no water-cooling equipment. The furnace stack was 100 ft. high, and had an inside diameter of 48 in. The oil was delivered to the burners at a pressure of 95 lb. per sq. in., and the effect of pump pulsations was counteracted by a standpipe and air cushion.

The oil used was that which is commercially known as fuel oil and came from fields near Lawrenceville, Ill. A draft at the base of the stack representing 0.8 in. of water was adopted and maintained throughout the tests. Reversal of furnace burners and valves were at 15-min. intervals.

STOCK CHARGED

In each heat 31,000 lb. or 55.3 per cent of chill cast Northern pig iron, 17,000 lb. of reasonably heavy foundry scrap, 8000 lb. of scrap rails, and 8400 lb. of limrock were initially charged. The average carbon content in the foundry scrap was 0.20 per cent, and the percentages of other elements can be assumed to agree closely with the averages noted in the steel produced during the tests. Purposefully the quality and physical characteristics of the metal charged were maintained uniform and the variable constituents kept low in all the heats so far as conditions permitted, in order that oxidation loss, quality of metal, etc., might be gaged intelligently.

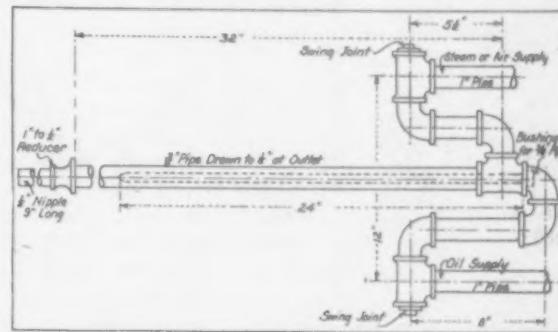
In the air tests, the compressed air was delivered from a receiver showing 80 lb. gage pressure and throttled to a pressure of from 40 to 60 lb. as desired at the burner. The average temperature of the air was 97 deg. Fahr. No apparent unusual effect was observed on the roof or bottom of the furnace, nor was any difficulty experienced at any time in making these heats. The average amount of magnesite, which was largely used for bottom repairs, was 660 lb. per heat.

In the steam tests, the atomizing agent was delivered from boilers showing 125 lb. gage pressure

and was superheated by passing through a coil 24 ft. long, made of 1-in. pipe, placed through the flue just outside the damper and throttled to a pressure varying from 40 to 60 lb. as desired at the burner. A pressure of 60 lb. was maintained until the stock was melted and the pressure was then reduced to 40 lb. to finish the heat. The degree of superheat varied somewhat and averaged 140 deg. Fahr., which was considered to be conservative for yielding the best results, as ascertained from experience. All members of the committee unhesitatingly agreed that the steam should be superheated, as otherwise there would be reduced efficiency due to saturation, the degree of which would vary greatly in different plants due to distances from boiler rooms and other local conditions.

The condition of the furnace in every respect checked satisfactorily with the condition when air was used. The average amount of magnesite used for patching bottom, was 350 lb. per heat.

On the assumption that in many plants it costs 2 1/2 cents to compress and deliver 1000 cu. ft. of air at a pressure of 80 lb., the average cost of compressed air can be figured at \$1.55 per heat; and



The Open-Hearth Furnace Oil Burner

taking a cost of 14.4 cents as representative for generating 1000 lb. of steam and delivering it at a gage pressure of 125 lb., the average cost of steam used in atomizing each heat is \$0.403.

The steels from the various heats made with each atomizing agent showed the expected uniformity; and the results by the two agents were closely approximate, according to both physical and chemical tests.

A comparative summary of results is here given, all items being averages:

Comparative Summary of Results

	Air	Steam
Weight charged per heat, lb.	57,880	57,727
Weight tapped per heat, lb.	58,246	58,351
Oxidation loss, per cent.	8.006	7.58
Time per heat, charge to tap, hr. and min.	7:45	7:52
Oil used per heat, gal.	1210.7	1206.4
Amount of air used per heat, cu. ft.	62,115	3,493
Amount of steam used per heat, lb.	0.203	0.197
Carbon, per cent.	0.014	0.0133
Phosphorus, per cent.	0.755	0.727
Manganese, per cent.	0.27	0.251
Silicon, per cent.	0.0226	0.0239
Temperature of bath 10 min. before tap, deg. Fahr.	3,195	3,169
Flue temperature, deg. Fahr.	1,129	1,112

Careful analysis of the tests herein reported indicates that no relation can be drawn between the results with either superheated steam or compressed air as to the quality of the metal produced, time required for making heats, oil consumption or temperatures secured.

DEDUCTIONS

It seems possible that there is a relation as to effect on the furnace bottom in view of the fact that the average content of magnesium oxide in the slag

*From a report submitted to the American Foundrymen's Association at Atlantic City, Sept. 30, 1915, by President R. A. Bell of the association, supervisor of basic atomization tests for the committee on steel foundry standards.

on the heats treated with air averaged 42.6 per cent higher than in the case of steam-treated heats. The absorption of more magnesite into the slag on the air-treated heats as shown by the slag analysis, seems to tally with the increased amount of magnesite required for bottom patching on these heats.

Although the oxidation losses in the two groups of heats did not vary greatly, the advantage is in favor of steam-treated heats, in which there was apparently about 244 lb. of metal recovered per heat, which was lost when atomizing with air.

As to comparisons of final costs, each plant of necessity must form its own conclusions, arriving at them by the local costs for compressed air and superheated steam as well as by comparative data given. These data may not in every respect seem entirely conclusive to all students of open-hearth practice, but are believed to be more reliable for purposes of comparison than anything heretofore publicly reported. It is pertinent to emphasize that the 15 heats treated with air were manipulated by the same crews that handled the same number of heats treated with steam, and that there was no prejudice on the part of furnacemen or observers conducting the tests, and abundant opportunity for the closest supervision.

Since the cost of delivering the required amount of air would be invariably higher than that entailed by the delivery of the required amount of steam superheated by any such economical means as is here reported, there would seem to be a considerable commercial advantage in employing superheated steam as an atomizing agent in basic open-hearth practice, with no loss to the quality of the product.

Pennsylvania State Employment Bureau

A State Employment Bureau, to relieve unemployment, was established Oct. 1 in Pennsylvania, to guide children into vocations for which they are best adapted, and to supervise all commercial employment agencies operating within the State. Jacob Lightner, Pittsburgh, has been appointed director of the bureau and central offices will be maintained in the Masonic Building, Harrisburg, Pa., with branch offices in Philadelphia and Pittsburgh. It virtually establishes, under State supervision, a free employment agency where employers may file their requests for laborers, skilled and unskilled.

Every commercial employment agency conducted for a profit will be required to pay an annual license fee of \$50 and to furnish a bond of \$1,000. It must also file with the State Department of Labor and Industry a schedule of fees charged employers seeking employees, or persons seeking employment, and that schedule may be changed only with the approval of the Commissioner of the Department of Labor and Industry.

In cities where compulsory education bureaus are maintained by the public school system a division of vocational guidance will operate within the compulsory education bureau in conjunction with the State Employment Bureau. Plans for such action have already been formulated by representatives of the State Department of Labor and the school authorities of Philadelphia and Pittsburgh. The division of vocational guidance is to aid a child between the ages of fourteen and sixteen to get work and to facilitate the efforts of employers desiring to hire children.

The American Association of Engineers, a recent organization putting special emphasis on promoting social conditions among engineers and focusing on welfare and employment problems, will hold its first national convention at the Hotel La Salle, Chicago, Dec. 10 and 11. Arthur Kneisel, 29 South La Salle Street, Chicago, is secretary.

AUSTRALIAN METAL CONTRACTS

Steps Taken to Dispose of Metal Concentrates Formerly Smelted in Germany

BY L. H. QUIN

The determination of the Australians to wipe out German influences from their metal industries is emphasized by every mail which arrives in England. The realization of the fact that their kith and kin have been slaughtered by thousands by Australian metal has cut them to the quick. It has required more than common courage to take this strong and determined stand in connection with one of the chief industries. The metal trade of Australia had for various reasons drifted almost entirely under the dominance of German houses, against whom drastic action has already been taken, but the question of contracts entered into for long periods by Australian mineral and metal producers with interests now hostile presented a very bothersome problem. It was not as if by cutting off these contracts Australia had a home market for the material or had home facilities available for converting it into merchantable forms, for except to a very small extent this was not the case.

GERMAN CONTRACTS

Notwithstanding this, however, the commonwealth government has acted swiftly and determinedly, and it appears that the following contracts entered into between Australian mines and smelting and other interests in which German capital predominated have been absolutely annulled:

July 29, 1912—Mount Oxide Mines, Ltd., of Sydney, Australia and Lohmann & Co. of Sydney and Melbourne, Australia, and Bremen, Germany; sale and delivery of 2000 tons of copper ore and matte.

May 12, 1911—Broken Hill Junction, North Silver Mining Company, No Liability, of Melbourne, Australia, and Aaron Hirsch & Sohn of Halberstadt, Germany; sale and delivery of the output of zinc concentrates to be produced by the mining company at Broken Hill, Australia, for a period of 10 years from Jan. 1, 1912.

Sept. 27, 1912—The Great Fitzroy Mines, Ltd. (incorporated 1908) of Melbourne, Australia, John Maynard Stokes of Melbourne, the liquidator of the above company, Australian Metal Company, Ltd., of Melbourne, and the Great Fitzroy Mines, Ltd. (incorporated 1912); (1) Transfer of the debts, liabilities, contracts, engagements and obligations of the old company to the new company as regards contracts with the Australian Metal Company, Ltd., and (2) sale and delivery of total production of blister copper from the new company's mine for period of two years and one month from June 30, 1912, with suspension during suspension of labor and with right to extension for three years.

March 28, 1912—Amalgamated Zinc (De Bavay's), Ltd. of Melbourne, and Australian Metal Company, Ltd., of Melbourne; Sale and delivery of 665,000 tons of zinc concentrates.

March 28, 1912—Amalgamated Zinc (De Bavay's), Ltd., of Melbourne and Australian Metal Company, Ltd., of Melbourne; Sale and delivery of additional quantity of zinc concentrates.

Sept. 10, 1914—Amalgamated Zinc (De Bavay's), Ltd., of Melbourne, and Australian Metal Company, Ltd., of Melbourne; agreement with reference to payment of certain moneys due by the Australian Metal Company, Ltd., to the Amalgamated Zinc (De Bavay's), Ltd., and with reference to the future disposal of the zinc concentrates of Amalgamated Zinc (De Bavay's), Ltd.

Sept. 17, 1914—The Union Bank of Australia, Ltd., Australian Metal Company, Ltd., and Amalgamated Zinc (De Bavay's), Ltd.; guarantee by the bank of the payment of certain moneys by the Australian Metal Company, Ltd., to the Amalgamated Zinc (De Bavay's), Ltd.

May 31, 1910—The Mount Cuthbert, No Liability, of Melbourne, Australia, and Australian Metal Company, Ltd., of Melbourne; appointment of the Australian Metal Company as sole broker and agent for the Mount Cuthbert, No Liability, in Australasia, Europe, and all other parts of the world.

July 2, 1913—Annan River Company, No Liability, and

Australian Metal Company, Ltd., of Melbourne: Sale and delivery of total production of tin concentrates from July 21, 1913, to July 21, 1914, but if 144 tons have not been delivered by July 21, 1914, contract to be extended until 144 tons have been delivered.

SALES TO THE UNITED STATES

The policy has not of course been put into effect without considerable inconvenience having been caused, but some of the Australian producers have been able to revise their present arrangements and to open up connections in entirely new quarters. For instance, the Amalgamated Zinc (De Bavay's) has commenced to develop relations in the United States, and has made important sales of zinc concentrates to that country, some of which are as follows: New Jersey Zinc Company, 1000 tons; American Zinc & Lead Smelting Company, 2900 tons; Robert Lanyon Zinc Company, 2000 tons; Granby Mining Company, 1000 tons, and the Edgar Zinc Company, 50,000 tons. The last-named sale was made at a price equal to £9 11s. 6d. per ton in America. The company has also sold 6000 tons to Marceilles for the Vieille Montagne Company's French plant.

That the development of the Australian smelting industry is receiving the very close attention of the commonwealth government is well known, and W. M. Hughes, the Federal attorney general, has had a long interview with interests representing leading Australian producers of zinc concentrates, at which the prospects of zinc smelting in Australia and of starting subsidiary industries for the production of sulphuric acid, sulphate of ammonia and galvanized iron were discussed at length. It has been announced as a sequel that the policy of the commonwealth government is to develop Australian industries in such a way that the products would reach their final marketable form in Australia.

SMELTING IN AUSTRALIA

Applying this policy to metals, no reason could be found why all of the lead concentrates produced in Australia should not be smelted in Australia. Since the war started all the lead concentrates produced there have been treated and the smelting capacity has been increased and is being further enlarged to deal with 5000 tons a week. The extension of the plant to this capacity is expected by the end of this year, while it is quite possible that steps would be taken still further to enlarge the output. When the plant already under construction is opened practically all the lead concentrates produced in Australia can be treated locally.

The position as to spelter is much more difficult, the present smelting capacity in Australia being only about 15,000 tons a year, but a temporary addition capable of treating another 4000 tons per year will shortly be available, while negotiations are proceeding which, if successful, should raise Australian smelting capacity to 50,000 to 60,000 tons. There is no doubt whatever but that one of the economic effects of the war will be the diversion of raw material from all parts of the British empire from German smelters and German metal interests to those which are exclusively of British origin, owned and controlled by British capital.

A contract involving the sale of 20,000,000 cu. ft. of gas per year for a period of five years to the Canister Company, Phillipsburg, N. J., maker of canisters and containers, has been effected by the Easton Gas Works, Easton, Pa. The fuel is used in furnaces for lacquering, tempering and soldering. A 4-in. high-pressure main is being laid for the purpose.

THE FORD COMPANY'S PROCESS

Single Furnace Heat Yields Foundry or Malleable Iron—Electric Furnace for Refining

The Ford Motor Company, Detroit, Mich., announces the successful completion of experiments looking to the production of various grades of pig iron from the same blast-furnace heat. While it is yet too early to make a complete statement of the physical and chemical properties of the iron manufactured, enough has been determined by physical tests and microscopic examination to render certain the possibility of producing gray iron, malleable iron and probably a semi-steel composition from the direct blast-furnace metal, without a cupola. The essential apparatus in the newly developed process is the electric furnace. Through the proper control of the refining action in this furnace the various grades of iron are produced from the manipulation of the carbon, silicon, sulphur, manganese and phosphorus contents.

The introduction of the charge as hot metal at a temperature of perhaps 2300 deg. Fahr. eliminates the excessive cost of heating the large mass from a low temperature with electrical energy, so that the amount of heat required to be generated in the electric furnace involves a comparatively small cost.

The use of mixers as an intermediate step between the blast furnace and the electric furnace would be unnecessary except that a reservoir for hot-metal storage will be required to take up the seven-day blast-furnace production as compared with the six-day operation of the foundry. The ability to bring the hot metal to whatever grade or analysis is desired in the electric furnace removes the necessity for working to analysis in the blast furnace, which will greatly simplify the matter of choosing proper ores for the blast-furnace mixture. The Ford Motor Company is working on a basis of a daily melt of 700 tons. Its problem is complicated by reason of the conflict in requirements between light flexible castings required for automobile construction and heavy strong castings for tractor building.

A Bulletin on Titanium Rails

The Titanium Alloy Mfg. Company, Niagara Falls, N. Y., has issued Bulletin No. 8 of its series of rail reports. It covers an examination of cross sections of A rails, taken after a discard of 8 to 10 per cent, including that at shear and hot saw, made at 7 of the 14 rail mills of the United States and Canada from samples forwarded to the Titanium company by the mills. Comparative analyses for carbon of 111 heats of standard open-hearth steel and 101 heats of titanium-treated, open-hearth steel, show the beneficial effect of titanium in reducing carbon segregation. The drillings to determine segregation were taken in accordance with the new method called for by the new specifications of the Pennsylvania Railroad, described in THE IRON AGE of Jan. 21, 1915. The bulletin closes with a merit comparison on samples from centers of heads and from flanges of 25 standard and 25 titanium-treated open-hearth A rails.

Germany's August Steel Output Highest of the War

The German steel output for August, 1,157,692 metric tons, exceeds that for July (1,138,478 tons), which was the record month since the war started. The daily rate was 44,526 tons, which contrasts with 42,168 in July, the best previous war record. In August, 1914, the total was 566,822 tons. This year's August output was made up of Bessemer steel ingots, 573,289 tons; open-hearth ingots, 497,638 tons; steel castings, 70,628 tons; crucible steel, 8720 tons and electric steel 12,843 tons. The large output of electric steel, which characterized July, is maintained in August. Production to Sept. 1, 1915, was 8,441,651 tons, against 11,582,498 tons to Sept. 1, 1914.

Heat Losses from an Electric Furnace*

Those Due to the Escape of Gases from Charging Doors and Tap Hole and to Electrode Conditions Based on Operating Data in a Steel Foundry

BY W. H. WILLS AND A. H. SCHUYLER

The furnace investigated is at the plant of the Treadwell Engineering Company, Easton, Pa. [and was described in THE IRON AGE, May 29, 1913]. It is of 2-ton rated capacity, with magnesite brick hearth overlaid with burnt dolomite. The pouring spout is in the center of the front side and at each side is a charging door. Three cylindrical graphite electrodes 8 in. (20 cm.) in diameter pass through the roof, threaded for continuous feeding, and are used in 180 lb. (82 kg.) sections 3 ft. (90 cm.) long. The power supply is 40 kw., 3-phase, 60-cycle alternating current, the potential between the electrodes being 80 volts and the normal current per phase 2500 to 3000 amp. The Easton Light & Power Company furnishes the current at 11,000 volts on the primary.

The object of the experiments was:

1. To investigate the heat losses due to gases issuing from charging doors and tap holes.
2. To investigate the heat losses by conduction into the electrodes and by the water jackets surrounding the electrodes.

AVERAGE OPERATING CONDITIONS

The product is high grade carbon steel castings, carbon 0.05 to 1.20 per cent; raw material—boiler punchings and structural steel scrap. Lime and some hematite are charged as flux, with fluorspar later. Coke dust is added toward the end of the run, to deoxidize the slag. Final additions of ferromanganese, ferrosilicon, and aluminum are made. The average length of the heat is 4½ hr. Electrode consumption per heat (2 tons) is about 60 lb. (27 kg.); per ton of steel, 30 lb. (13.6 kg.); per kw. hr., 0.0375 lb. (17 grams). The average power input during the test was 350 kw.

1. HEAT LOSSES THROUGH ESCAPING GASES

Sheet iron flues to facilitate collection of the issuing gases and their measurement were fitted to the furnace doors and tap-hole. The one for the charging doors had a 6-in. pipe, and the one for the tap-hole a 3-in. pipe. The temperature of the escaping gases was measured, as they issued, by a LeChatelier thermocouple, protected by asbestos tubing. The temperature of the gases leaving the pipes, where the velocity was measured, was taken by suitable mercury thermometers. The velocity of the gases issuing from the 3-in. pipe was measured with 2½-in. (6 cm.) anemometer and on the 6-in. (7.5 cm.) pipes and with a 6-in. anemometer. An Orsat apparatus was used to analyze the escaping gases.

On the first test, April 16, 1915, the length of the run was 4 hr. 25 min. The sheet iron flues were placed over the charging door openings and tap hole, and carefully plastered around with fire clay. The following observations were taken at approximately equal intervals:

1. Temperature of gases escaping through the door and tap hole.
2. Temperature of gases leaving pipes.
3. Velocity of gases leaving pipes.
4. Power input to the furnace.
5. Sample and analysis of furnace gases.
6. Barometer reading.

*From a paper presented at its twenty-eighth annual meeting of the American Electrochemical Society at San Francisco, Sept. 16 to 18, 1915. The authors are connected with the metallurgical laboratory of Lehigh University, South Bethlehem, Pa.

In taking the temperature of the escaping gases, the hot junction of the thermocouple was placed at different points in the openings and an average reading of the temperature of gases escaping was obtained.

Table 1 gives a general log of the observations taken:

Table 1.—General Log of Observations of Temperatures of Gases Leaving Doors and Tap Hole

Time	Initial Temperature of Gases, Deg. C.	Temperature Leaving Pipes, Deg. C.	Velocity of Gases Leaving Pipe		
			Feet per Minute	Meters per Minute	Power Input, kw.
12.30	Furnace charged.				
1.30	door 1.....745	215	310	80	
	door 2.....755	158	340	86	300
	tap hole.....716	202	300	76	
2.00	door 1.....755	230	295	75	
	door 2.....723	142	290	73	300
	tap hole.....735	312	240	61	
2.30	door 1.....774	242	335	85	
	door 2.....784	117	290	73	300
	tap hole.....735	256	260	66	
3.00	door 1.....842	255	320	81	
	door 2.....832	110	256	65	350
	tap hole.....745	230	300	76	
3.15	door 1.....866	265	334	85	
	door 2.....804	108	260	66	360
	tap hole.....876	192	288	73	
3.30	door 1.....903	270	325	82	
	door 2.....850	110	245	62	350
	tap hole.....920	235	202	74	
4.00	door 1.....1000	282	350	89	
	door 2.....929	115	250	64	350
	tap hole.....973	195	300	76	
4.30	door 1.....1018	210	370	94	
	door 2.....964	112	255	65	270
	tap hole.....1010	203	284	72	
5.00	Furnace tapped.				

Table 2.—Analysis of Gases.

Time	Opening	Carbon Dioxide, per Cent	Oxygen, per Cent	Nitrogen, per Cent
1.30	door 2	3.6	18.6	79.2
2.00	tap hole	1.8	9.4	78.8
2.30	door 2	0.4	20.2	79.4
2.50	tap hole	5.0	16.9	78.1
3.15	tap hole	3.0	18.1	78.9
4.00	door 1	3.2	14.9	81.9

Table 3.—Heat Losses

Time	Opening	Corrected Volume of Escaping Gases per Minute, Cubic Meters	Temperature, Deg. C.	Calories Lost per Minute	Kilowatt Lost	Total Loss, Kw.
			Door 1	Door 2		
1.30	Door 1	1.1	745	273.5	19.07	
	Door 2	1.216	755	304.8	21.25	44.4
2.00	Door 1	0.247	716	58.4	4.08	
	Door 2	0.932	755	245.3	17.10	40.00
2.30	Door 1	0.1093	723	274.0	19.12	
	Door 2	0.202	735	54.1	3.78	
2.50	Door 1	1.006	774	256.7	17.9	
	Door 2	1.162	784	796.1	20.65	41.8
3.00	Door 1	0.194	735	46.4	3.24	
	Door 2	0.941	842	267.5	18.62	
3.15	Door 1	0.832	832	233.	16.27	
	Door 2	0.233	745	58.1	4.06	
3.30	Door 1	0.961	806	277.8	19.38	
	Door 2	0.073	804	288.1	20.10	44.40
4.00	Door 1	0.242	876	70.7	4.93	
	Door 2	0.930	903	288.9	19.64	
4.30	Door 1	1.010	850	285.3	19.92	44.60
	Door 2	0.225	920	69.4	4.84	
4.30	Door 1	0.975	1000	329.9	23.00	
	Door 2	1.014	929	316.7	22.10	50.55
4.30	Door 1	0.251	973	82.4	5.75	
	Door 2	1.180	1018	406.9	28.37	
4.30	Door 1	1.038	964	337.7	23.55	57.50
	Door 2	0.234	1010	80.00	5.57	

2. ELECTRODE HEAT LOSSES

The furnace was provided with three electrodes passing through the roof of the furnace, each being in sections of about 3 ft. long and weighing 180 lb. per section (82 kg.). In the electrode holders electrical connection is made by copper plates screwed fast against the graphite and connected to the busbars by heavy stranded copper cables.

The tests on electrode heat losses were run on April 17, 1915, from 9:35 a. m. to 1:35 p. m. Two chalk marks were made on each electrode between the water jacket and the electrode holder. The temperature of the in-

coming and outgoing water for the electrode water jackets was measured with ordinary thermometers.

The following observations were taken every half hour:

1. Temperature on the electrode surface at each chalk mark.
2. Power input to the furnace.
3. Current passing through each electrode.
4. Temperature of cooling water entering and leaving water jackets.
5. Rate of discharge of cooling water.

The temperature of the electrode surface was taken by a thermocouple pressed by a small piece of asbestos tightly against the surface of the electrode. From these observations the calories carried away from the electrode by the cooling water and by conduction through the electrodes could be calculated, using the heat conductivity of graphite for the range of temperature observed.

(The original paper contains tables of the details of the log of cooling water, the heat loss in water jackets, temperature observations on electrodes and the flow of heat in kilowatts.)

Table 4 gives the rate of total electrode loss, by cooling water and by conduction through the electrodes, and its percentage of the power input of the furnace:

Table 4.—Rate of Total Electrode Loss by Cooling Water and by Conduction Through Electrodes

Observations	Cooling Water, Kw.	Electrodes, Kw.	Total, Kw.	Power Input, Kw.	Percentage Loss
1	11.95	5.622	17.572	200	8.79
2	9.30	7.704	17.004	360	4.75
3	9.97	7.261	17.231	375	4.60
4	13.95	8.019	21.969	350	6.26
5	15.18	7.945	13.125	400	5.78
6	18.38	8.441	26.821	300	8.94
7	22.60	8.646	31.246	300	10.42
8	23.30	9.358	32.658	310	10.53
Average	.....	.....	.....	7.30	

GENERAL REMARKS

Both tests were run when the furnace was in good operating condition, for a new lining had been put in the day previous to the first test.

Several factors combine to vary the amounts of gas escaping through the different doors. Chief among these is the direction of the air currents through the foundry. During the latter part of the run a noticeable draft was blowing toward the right-hand charging door (No. 2) so the volume of gas escaping through this door was reduced while a corresponding increase was produced in the volume escaping from the tap hole (No. 3) and especially in the volume escaping from the left-hand charging door (No. 1). These changes are clearly shown by the gas volumes issuing from the different doors.

Each time flux was added to the bath the gas volume was appreciably increased for several minutes while flames shot out through the door openings. Just after the furnace is charged the gas volume is greater, due to the driving off of moisture and other volatile constituents of the charge and to the combustion of oil on the scrap steel. This probably accounts for the high heat loss through the doors at the beginning of the run.

As shown by the tables the loss increased toward the end of the run, being a maximum at tapping time. This is perfectly natural, for it is at that time that the furnace temperature is a maximum.

There is comparatively little gas generated in the simple melting-down operation. It was observed that a considerable portion of the furnace gases must be supplied by cold air flowing in under the charging doors through the opening between door and sill, where an appreciable in-draft was noticed. The furnace thus has to heat up this unnecessary air and then discharge it at a high temperature through the openings at the top of the charging doors and tap hole. This means lower efficiency.

The charging-door loss could be reduced very materially by making the doors fit closely against the furnace walls so as to cut off as much as possible the air flowing in at the bottom and the outgoing gases through the opening at the top. In the design of subsequent

furnaces of this type two methods could be employed to accomplish this result:

By the use of a round charging door in the form of a plug mounted to swing on vertical trunnions. This does away with counter weights and permits the door being made thick enough to reduce leakage to a small amount.

By having the furnace walls slightly inclined inward at the charging door ends and using vertically sliding doors with counter balance. The pull of gravity would then hold the doors with sufficient firmness against the walls.

The electrode heat loss is a necessary evil. Of course, the more electrodes through the roof the greater this loss amounts to, so the only way to minimize this on a small furnace is to run on single phase. Graphite electrodes were used on this furnace, which means a higher heat loss than with amorphous carbon electrodes.

The high electrode loss at the beginning was due to the fact that the electrodes, which were very hot from the previous heat, had been raised up to allow for the new charge, so that the surface ordinarily well below the water jackets was exposed and the portion next to the water jackets was red hot. This made the surface temperatures at first higher than they would be if the furnace was started cold. As the furnace temperature rose toward the end, the electrode loss naturally rose. This rise was more noticeable in the heat carried off by the cooling water than in that traveling up the electrode by conduction. The temperature at the two marks on each electrode did not change as much as might be expected, because the electrodes, after being pushed a maximum distance down into the bath when the charge was first melted down, were gradually withdrawn, so that the marks rose higher and higher above the water jackets. If the furnace temperature had remained constant, the surface temperature at the marks would have fallen.

The formulas used in calculating the heat passing out through the electrodes depend on the assumption that the electrodes have uniform cross section throughout their length, that the conductivities for heat and electricity are linear functions of the temperature, and neglect the loss by radiation from the electrode surface between the points at which the temperatures were taken. Since the distance between these points was comparatively small this radiation loss amounted to very little. The electrodes were uniform in cross section throughout.

The heat carried off in the water from the electrode water-jackets is not all from the electrodes, but a considerable part is from that part of the roof adjacent to the electrode openings. However this loss is made necessary by the electrodes and so may be counted under the head of electrode losses.

CONCLUSIONS

By integrating the door and electrode loss curves and dividing these areas by their length, the average door and tap hole loss was found to be 12.5 per cent and the electrode loss 7.3 per cent of the power input to the furnace. The electrode loss cannot be cut down much so long as graphite electrodes are used, but the door loss can be reduced a considerable amount by making the charging doors fit closely against the furnace walls, and the tap hole loss reduced by suitable closing devices.

Safety in the press-working of metals is treated at length in the September issue of *The Travelers Standard*, issued by the Travelers Insurance Company, Hartford, Conn. A number of approved protection devices are illustrated. "Very often," says the article, "the expected loss of efficiency from the introduction of guards proves illusory, and does not materialize at all. The curtailment of production is usually only temporary, if the guards are well designed, and it frequently happens that as soon as the operators become accustomed to them the feeling of security that results allows them to work at an even higher rate of speed than before, so that after a time there is a real and permanent increase in efficiency."

CASTINGS FROM BLAST FURNACE

Converter Blown and Unblown Iron Mixed—Opportunity for Introducing Oxygen

In view of recent comment regarding the possibility of making iron castings direct from the blast furnace and of the fact that some time ago J. E. Johnson, Jr., consulting engineer, New York, had indicated the feasibility of such a process, a statement was obtained from him and the following has been prepared as an outline of Mr. Johnson's method and the purposes underlying it:

Mr. Johnson discovered, as reported in THE IRON AGE of Feb. 19, 1914, that the presence of oxygen imparts to the high-grade irons, notably the best brands of charcoal iron, the close grain, strength and chilling power for which they are known. He applied the discovery in the invention of a process to make possible "the simple and inexpensive manufacture from ordinary coke iron of an iron having the desirable qualities in a degree exceeding the best brands of charcoal iron." The process may be practiced by various means and mechanisms, "desirably," he says, "by using an ordinary type of plant and blowing iron taken directly from a blast furnace in a Bessemer converter at a low temperature, so that the silicon is nearly all burned out before any of the carbon burns, and stopping the blow when the carbon flame appears. This impregnates the bath with oxygen and by mixing other iron direct from the furnace with the white iron so produced, silicon is restored without removing all the oxygen." The idea is that this converts the iron from white back to gray, producing what has come to be spoken of as Johnson iron.

The making of castings with metal direct from the blast furnace aims of course at saving the cost of remelting and preventing an increase in sulphur, and is only followed on an important scale in the manufacture of ingot molds, which are very large castings of special quality. In this connection Mr. Johnson emphasizes that when containing the percentage of silicon customary in iron castings, 1 per cent up to 3 per cent, and the percentage of sulphur to which good irons are limited, generally under 0.04 per cent, blast furnace iron while molten throws off graphite in such great quantities as to ruin the castings, "the graphite rising and accumulating in loose masses in the top of the mold and causing the casting to be porous and spongy under the best conditions or causing a great cavity in it under others."

The reason why these phenomena do not occur in cupola melted iron, he says, is partly that the sulphur introduced in remelting retains the carbon in the combined condition, but there is a further action, little understood until recently, which is as follows:

Ordinary coke irons contain, as cast, little or no oxygen. The absence of oxygen opens up the grain of the iron and tends to throw the graphite into very large, broad flakes which destroy the continuity of the iron and are sometimes large enough to rise to the surface, while the presence of oxygen in small quantities throws this graphite into much smaller flakes and when the oxygen is present in larger quantities, reduces the graphite to the nodular form. A certain amount of oxygen is imparted to the iron in the cupola along with the sulphur and their joint influence prevents the formation of the large masses of graphite and makes possible the production of merchantable castings, although the presence of sulphur is objectionable on other accounts, since it makes the iron brittle and tends to produce a surface high in combined carbon, and therefore difficult to machine.

To regulate the composition of the castings produced from the blast furnace, by altering the proportions of the blown and unblown portions of the charge, is a simple matter in the opinion of Mr. Johnson. Even without the use of a mixer, he says, an analysis of the iron can be obtained from the laboratory or experienced men can estimate its contents of silicon and sulphur with all needful accuracy from the fracture of a chill-cast sample before the blow is completed. With this information and knowing the contents of the metal in silicon at the end of the blow, the required proportions of blown and unblown metal may be calculated. It is possible to produce, he adds, from the same original heat or cast, iron of very different composition and correspondingly different characteristics to meet the requirements of different kinds of castings. Plans are under way, he says, for the production on a large scale of Johnson iron castings from the initial heating of the blast furnace.

The X-Ray in Metallurgical Research

Besides the important work in examining metals for blow holes or cavities by means of the X-ray, performed by Dr. Wheeler P. Davey of the General Electric Company and described at various times in THE IRON AGE, an investigator in Japan has also made some interesting researches of this nature. C. H. Tonamy, engineer of the Mitsubishi Dock Yard & Engineering Works, Kobe, Japan, presented a paper before the autumn meeting of the Institute of Metals (England) on Sept. 17, 1915, on "Detecting Blow Holes in Metal Castings with the X-ray." Mr. Tonamy said in part:

Such defects being usually only discovered when the material is subjected to machining, the application of X-rays for this purpose seemed likely to be of great service. Particularly is this the case with copper castings, since pure copper, when at a high temperature, absorbs gases from the air, thereby rendering likely the formation of blow holes. When making these castings a small quantity of phosphorus is usually added as a deoxidizer. Blow holes, however, are always to be guarded against and in order to study their occurrence the author made some X-ray experiments upon a thin casting of pure copper, using a Gundelach X-ray tube.

The specimen which was used in the experiment was a plate of pure copper cast at a high temperature. The plate measured $5 \times 4\frac{1}{2} \times \frac{1}{4}$ in., with a hole $\frac{1}{2}$ in. in diameter and $4\frac{1}{2}$ in. deep drilled in one side, as shown

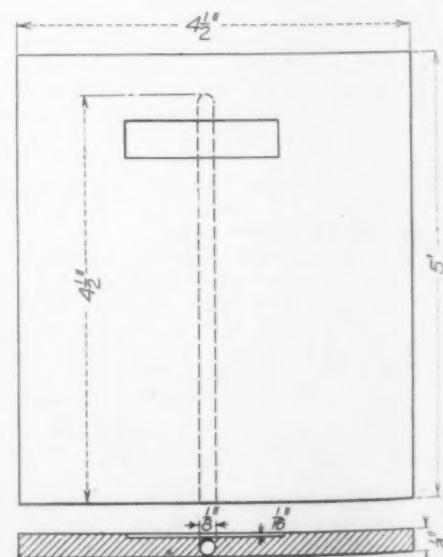


Fig. 1—Sample of Pure Copper Casting for X-Ray Examination, End View and Plan

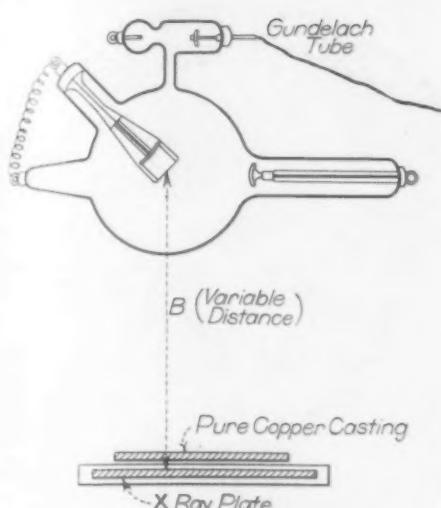


Fig. 2.—Arrangement of X-Ray Apparatus for the Examination of Copper

in Fig. 1. A channel $1/10$ in. deep was drilled on the surface, in order to vary the thickness of the plate.

The apparatus used in obtaining the radiograph of the blow-holes, drilled hole, and channel is shown in Fig. 2. The specimen was laid on the X-ray plate vertically under the Gundelach tube. By varying the vertical distance B between the center of the tube and the X-ray plate, the time of exposure and the strength of current, the following results were obtained:

Vertical per- mit- tance, cm.	Strength			Remarks
	Time of Ex- posure, m. sec.	Current, milli- ampères	Milli- ampères	
1	50	2	0.8	Very faint spots obtained which indicated the positions of blow-holes.
2	30	2	0.8	More distinct spots obtained.
3	15	5	0.6	Much more distinct spots obtained, together with the radiograph of the hole in the sample.

In order to verify the results so obtained, the plate was sawed across through the indicated positions of the blow-holes, and these were found to be continuous. In this experiment an X-ray source of ordinary strength was used; but had there been employed a much more powerful source, such as the Coolidge tube used by Dr. Wheeler, the radiographs would certainly have been sufficiently distinct to determine the exact position of the blow-holes. Moreover, by taking radiographs in two directions at right angles to another the depth of the blow-holes beneath the surface of the plate could be determined. There is little doubt that useless work in the machine-shop might be saved by testing metals by means of X-rays, as described above.

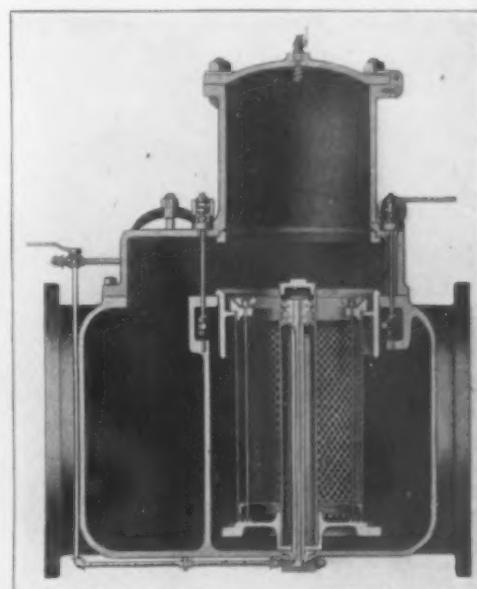
The A. M. Byers Company, Pittsburgh, Pa., has issued its Bulletin No. 26, which contains considerable useful information about the company's pipe including its resistance to corrosion and fabricating and welding qualities, specifications for wrought-iron pipe and details about hand puddling, rolling of muck bars, skelp, etc. Complete tables of prices, dimensions, areas, hydrostatic tests, etc., are included. A list of installations of the pipe with the amount of service given by it as compared with other grades installed in the same building for similar service is included.

French imports of German machinery, engines, etc., in 1913, according to data published by the French customs authorities, amounted to 40.1 per cent of the total weight and 41 per cent of the total value. From Austria the proportions were very small. The total French machinery imports in 1913 were 221,028 metric tons of which 88,632 tons came from Germany.

Power Operated Multi-Basket Strainer

The Lagonda Mfg. Company, Springfield, Ohio, is equipping its standard design of multiple-basket strainer for power plant and pumping station intake lines, which was illustrated in THE IRON AGE, Oct. 31, 1912, with an automatic arrangement for raising and lowering the individual baskets. This change has been made with a view to enabling the baskets, which in the larger sizes of strainers are both heavy and large, to be raised and lowered more easily than was possible with the former hand-wheel and screw stem design. Either compressed air or water pressure is employed for raising the baskets, each of which is an independent unit with separate cleaning chamber valve and air or water control. In this way it is possible to raise any basket, remove it and clean it without interference with the operation of the remaining ones. A section of strainer through one basket, showing the construction and operation of the baskets and the raising mechanism, is presented in the accompanying halftone.

The basket is supported on a circular base or disk which also serves as a valve seat when the basket is raised. A small-diameter cylinder is attached to the disk, the whole moving freely up and down on a piston and piston rod that is rigidly connected to the strainer body. Two conduits communicating with the upper and lower sides of the piston and connected through a four-way control valve to the pump or air compressor are provided for the piston rod. The operation of raising or lowering the basket is similar to that of an air-brake and by throwing the handle of the four-way valve to one side, pressure is applied to the upper side of the piston and the basket is raised to the cleaning chamber. The basket support or lower valve seat engages the sliding valve collar of the strainer, carrying it up with the basket, this arrangement being relied upon to close the cleaning chamber or bonnet. While the air or water pressure is ordinarily sufficient to seal the valve watertight, to guard against possible leakage or chance lowering of the disk while a basket is removed a cam lever locking device is applied to either side of the strainer bonnets. With the basket in the



Section Through One End of a Hydraulically or Pneumatically Operated Multi-Basket Feed Water Strainer Showing the Operating Cylinder and Control Valve for Raising and Lowering the Basket and the Cam Lever Locking Device for Keeping the Baskets in Position

raised position, the handle of this locking device is brought into a vertical position and swung around until the projecting support is swung under the valve disk. The handle is then drawn down into a horizontal position, the cam drawing the supports tightly against the disk, thus insuring a tight fit and locking it in place. When the basket is raised the top of the cylinder engages an indicator rod in top of the flange cap which rises to show that the basket is in the cleaning chamber. As soon as the basket is lowered a spring pulls the indicator rod down, showing that the basket is in the straining position. In the flange cap a pet cock is provided to relieve pressure in the cleaning chamber, thus enabling the hinged flange cap to be unbolted easily and opened for the quick removal of the basket.

BRITTLENESS IN STEEL

A French Experience in Which It Persisted After Corrective Heat Treatment

An interesting short article by V. Bernard and A. Portevin, on a case of persistent brittleness found in a drop forging that broke in service, appears in the *Revue de Metallurgie* for March. Shock tests on samples taken near the fracture gave 4.5 kg. meter per square centimeter, a low result and much less than should be given by a similar steel properly treated. Microscopic analysis showed the usual mixture of ferrite and pearlite, but with a very coarse structure toward one side of the piece. The cause of the brittleness was apparently plain, and new tests were made on samples heated at 850 deg. C., quenched in water, and reheated at 700 deg. C. The results were exactly the same as before.

In view of this lack of success the microscopic examination was again made with care, particularly in regard to the coarse ferrite network seen when using low magnification. The photomicrograph, Fig. 1, taken at 50 diameters, apparently is very good, but if examined carefully it shows a coarse network of ferrite running through the structure. Higher magnification shows lines of very small cavities running through the middle of the ferrite, as seen in the photomicrograph, Fig. 2, taken at 450 diameters. In certain places inclu-



Fig. 1.—Photomicrograph, 50 Diameters, of Section of Brittle Drop Forging



Fig. 2.—Photomicrograph, 450 Diameters, of Portion of Steel Represented by Fig. 1

sions also are found following the same direction, as in photomicrograph, Fig. 3, also taken at 450 diameters. The reason for the persistent brittleness is therefore plain. The lines of cavities and inclu-



Fig. 3.—Photomicrograph, 450 Diameters, of Portion of Steel Represented by Fig. 1

sions, due to a previous crystallization, form a network along which the cohesion is very low and this network does not disappear with heat treatment.

G. B. W.

A course in industrial engineering has been established by Sibley College, Cornell University, and 43 seniors have elected this year to pursue the work. Herman Stephenson, who has been associated with H. L. Gantt, consulting industrial engineer, New York, has been added to the faculty of this department.

Most of the magnesite exported from Austria comes from the plant of the Austro-American Works at Radenthein, Carinthia. This company, practically all American owned, has developed its plant during the war and greatly increased its capacity. It has also established works for making magnesite brick.

The Three Position Plan of Promotion*

A Definite Scheme of Advancement for Every Employee in the Plant Raises Its Efficiency by Showing Men Where Their Jobs Lead

BY F. B. AND L. M. GILBRETH†

The members of the organization having been selected and assigned to their various types of work, the next problem that presents itself is the problem of promotion. While that organization is strong that can hold its members, once having gained them, it is also desirable and necessary, in order that it progress, that every member of the organization be constantly advancing, or shall, at least, see before him the opportunity constantly to advance provided he uses his best efforts.

SHOWING THE LINE OF PROMOTION

The provision for promotion under the measured functional, or scientific, type of management was shown by the functional chart,‡ where the lines connecting the various circles that represent the functions show possible and definite paths of promotion for every member of the organization, no matter where he starts, if he has the desire, ability, and merit to pass into any position in the organization. This underlying principle of promotion is illustrated again in our sub-functional chart. This is simply a list under each function of all the sub-functions that it comprises, made in such a way that it is possible to visualize how any member of the organization can pass from one position to another.

But the sub-functional chart, excellent as it is as a representation of the work that is to be done, and the number of different types of men who are to do the work, is strongest in influencing the human element only when it also represents the master promotion chart. This chart arranges the sub-functions in such a manner that it is possible to see the lines of quickest sequence for greatest ultimate promotion extending from the messenger boys or apprentices, who enter the organization practically untrained, to the heads of the various departments and the chief men of the organization, and for all men and positions in between.

It would be of little use in a study such as this to introduce working examples of such charts, as they are necessarily technical, and as the names of the sub-functions are necessarily so specific and unrelated to the experiences of the general reader that the universal application of the principles is likely to become lost in the apparently limited field covered by the illustration. We, therefore, hope to present them in detail in a later book.

MAKING THE MASTER PROMOTION CHART

Our master promotion chart is a representation of the method of least waste in profitable placement and promotion. The problems in making up such a chart are naturally complicated. It is necessary to provide direct lines of advancement for all those of such training and ability that they can go very quickly through the different stages necessary to gain the proper amount of experience and education. It is necessary also to provide less direct paths by which those who have had less opportunity and who require, perhaps, more experience and

teaching may advance through more stages to a satisfactory goal. It is also necessary to devise cross cuts and bypaths by which those who have been mistaken in their desires or their capabilities can change over to another path, that, perhaps, will prove better suited to their needs. It is necessary particularly to avoid what have been called "blind alleys," that not only easily become established in a large organization, but that the nature of certain people makes it almost impossible for them to avoid.

The indication of a "blind alley," that is to say, of a path without better prospects definitely connected, that comes to a dead stop, where the experience gained is not specially useful to obtain further promotion, and requires the one who takes it either to go back to the beginning or to stay where he is, must be regarded as a grave danger to an organization, as well as to the man. The master promotion chart automatically brings immediately to the attention of the proper functioneer such a "blind alley" condition, should one ever arise. The superintendent must make it his immediate business to see that the man in the "blind alley" job is led out into an open path, and that the "blind alley" is abolished or transformed into a direct way. Otherwise he must find a worker whose possibilities and capabilities make him the "first class man," to occupy with mutual satisfaction such a position permanently. This master promotion chart is one of the most valuable possessions of the man in charge of the organization. It shows him in a very definite way not only which men are occupying the various positions, but which men have occupied them and know the work and can act as teachers in case of an emergency, and which men are coming along, being fitted to fill the position and available in case of a sudden or unexpected call for extra help in any one place.

THE THREE POSITION PLAN OF PROMOTION

In order to divide this large problem into working factors, the organization is looked upon as consisting of small groups of men who are operated by what we call our "Three Position Plan of Promotion." The "Three Position Plan" makes of each particular sub-function a center about which are grouped three individuals—the man who has just been promoted from the position, the man occupying the position, and the man who is preparing himself for the position. This little group holds a most important place in this system of industrial and managerial education. Every man in the organization is supposed to belong to *at least* three groups.

1. He belongs to the group in which he is the next man in line for a position, and is a learner.
2. He belongs to the group in which he is the man in the position, and, where, if he finds himself in any difficulties, he is still learning from the man or men who previously held the position. He is at the same time teaching the man next in line for his present position.

3. Finally, he belongs to the group in which he is the man who has just left the position, and is, if called upon, teaching the man who is filling the position that he has left.

*Copyright, 1915, by F. B. and L. M. Gilbreth.
†Consulting engineers, Providence, R. I.
ISSN Aug. 7, 1915.

He may, incidentally, belong more or less temporarily, at least, in a consulting capacity, to any group not so far advanced as his own, through which he has passed, as any member of the organization can always call on any one ahead of him for help and teaching in case he needs it; or he may belong to as many groups as he chooses more advanced than he, for he is at perfect liberty to learn as much as he can of the positions he is planning to fill, and those who occupy the positions will be more than glad to teach him, if he shows the right spirit, as their promotion depends upon training men to do the work at which they are engaged. At least, their promotion is probably quicker the more members there are who can fill the positions, and thus enable them to proceed higher.

OUTLINING THE INDIVIDUAL'S PROGRESS

As for the individual member of the organization and his method of visualizing exactly the path that he is going to take, he is provided with our Individual Promotion Chart, which we sometimes call a "Fortune Sheet." This shows his probable line of promotion, that he and the man in charge of the organization have decided is the one which it will be possible, probable, and mutually profitable for him to follow. Upon this sheet is marked, usually in green, a path that shows his probable sequence of progression. Upon this path is also marked, preferably in red, his actual progress, so that he and those interested in him can see exactly how and to what extent the prophecy is being fulfilled, and what changes in his "Fortune Schedule" should be made in the light of past experience. Upon this chart may be recorded, in such a manner as fits the particular organization, the entire history of his connection with the organization, his successes and his short-comings, his written suggestions and the outcome of them. This not only shows his progress, or how far he is from where he started and from where he aims ultimately to be, but the pace at which he is progressing.

Along with this "Fortune Sheet" may be kept what are called "Fitness Sheets," upon which may be recorded, either by the man himself or by some one whose duty it is to do so, his life history and experience, so far as he is anxious to have them recorded, as an aid to those in charge in helping him "find himself." It is one thing to present a blank form asking questions as to home conditions, training in various lines, and experience, to an applicant for a position: It is quite another thing to present such a blank to a man who is an established and interested member of an organization, and who understands that the data to be thereon recorded is to be used in order to aid in his more rapid and more profitable promotion.

When to the information contained in this blank is added that which comes through the employment bureau's record, the disciplinarian's record, and the record kept by the various other recording agencies of the organization, a mass of information results that cannot help but result in a more intelligent understanding of the possibilities of the individual and of his line of most profitable advancement.

PROVIDING VACANCIES FOR PROMOTION

To the reader unacquainted with the details of this system of management and its underlying principles, three questions must inevitably occur. The first is, "How can you promote any one member unless every member in the organization is constantly being promoted?" It stands to reason that in order to be a proper incentive, promotion must be, as far as possible, dependent upon achievement and ability, and not upon a more or less uncertain

opportunity or time of service. There will be little incentive to work for promotion, if one must feel that the promised promotion can only come if the man ahead is discharged, resigns, or dies. Actual practice proves that almost every man in an organization that is run on this line has a desire to advance, and does advance from one position to another.

It may, however, happen that the man in the place ahead does not advance, and does not wish to advance, out of that position, and has found work that satisfies and suits him, and that is where he desires to remain. In this case the new candidate for the position may come in contact with that work only long enough to receive merely that training which is needed there in order to proceed to the position next ahead. The man occupying the position permanently will be only too glad to teach the candidate rapidly, in order that he may go on, and he *will* go on in a short space of time to the position above, and from there on.

If it should happen, as, of course, it could, though it seldom does, that the second man coming up should also desire to hold permanently a position which is already being held permanently, he may have to be transferred to another branch in the lines of promotion or to another organization. It will not be a case of putting him out of the organization even then, but of passing him over as a gratefully received gift to an organization that is in the process of installing management. For the type of man who is thoroughly prepared and has found his life work and is satisfied in it has more places waiting for him than he can possibly fill.

HOW MEN HAVE ADVANCED

The second question that usually arises is, "What have you actually done? This plan sounds very attractive as outlined, but do the men really advance in any decided way under this plan of promotion, and can you cite examples to show what they do?" The answer to this question is, "Yes, they do so advance, and a great many specific examples can be cited." For example: In less than two years on one job a machinist became inspector; a probation messenger became an assistant in the purchasing department; another machinist became a route chart maker; a foreman of a floor became a superintendent; a messenger became the head of the information bureau; a draftsman became the chief disciplinarian, and the head of the employment bureau; an assembler became a production man; a draftsman became head time study man; and a skilled laborer became a machine shop foreman.

It is realized that these specific examples can mean very little, for the reason that the general reader cannot understand exactly how these men were advanced, many of them through many positions until they came to the one that they occupy at present. Neither, unless he has had experience in this particular type of work in a particular section of the country, can he understand that under ordinary management the likelihood is that the majority of these men would to-day occupy very much the positions that they did occupy two years ago. It goes without saying that in the case of all these men the various positions that they have left are filled by men whom they have helped to train, and the positions that they now occupy have been left by men who in turn have been promoted into positions ahead.

THE "GODFATHER MOVEMENT"

The third question that arises is as to the maintenance of this plan of promotion. "How is it

possible for one man who, during the installation period, is supposed to be the man in charge of the installation, to direct the fortunes of a large number of men, and exactly what happens after the installation period, when the chief installer is no longer there, and when the promotion plan must be carried on?" The answer to this question is in what we call the "Godfather Movement" and what might be likened in a way in its fundamentals to the Big Brother Movement now gaining in strength throughout the entire length and breadth of the country. Not only is the installer interested in every man in the organization, but it is his duty to select men occupying the higher positions in the organization, who can and will act as godfathers to those coming up in the various lines over which they are heads.

It is planned that every man in the organization who has reached a certain stage of advancement shall ultimately be godfather to some, usually younger, and certainly less trained men and boys coming up in the organization, and shall make their training, promotion, and welfare an object of personal and continuous interest. By training these godfathers in the duties of their positions during his stay, the installer will not only insure continuance of the human and personal element of the promotion system, but will also be able to determine which man among these godfathers is most capable of becoming the head of the whole plan, and of being in charge of the personal relation that exists in the promotion plan. There is a chance here for the development of all sorts of disinterested feelings, while at the same time any element of possible patronage is removed by the fact that it is, as has been before said, necessary, in order that a man be advanced, that he train those under him to be able to perform his duties.

THE ULTIMATE EFFECT

The effect of this system of promotion upon the man, upon the organization, and upon society will be left for a later summing up. It will simply be noted here that, while the emphasis, as can be plainly seen, is laid upon the human element, the quantity and quality of the output is maintained and increased continuously, while the various men are passing through what may seem a very short tenure of the various positions. This discussion is not the place to cover in full the checks that scientific management provides by inspection and over-inspection of quality, of effort, or of work. No one doubts that quantity will be maintained, for it is universally recognized and sometimes over emphasized, that, in the final analysis, in order to exist, every industrial organization must pay. A scientifically managed organization must pay, and pay it does. That such organizations exist shows that they pay financially. It must be our aim to show that they can also be made to pay from the standpoint of human betterment in a larger number of "Happiness Minutes," and to specify here that the method of promotion shall make of the members of the organization operating under it more valuable human beings—more valuable to the organization, to each other, to themselves, and to the world at large.

The Mayer Bros. Company, Mankato, Minn., has issued two folders descriptive of its Little Giant power hammers and calling attention to the wide range of work that can be handled by them and the increased output that can be secured. Special emphasis is laid upon their rapidity and precision in operation, and mention is made of the fact that they are in use by a number of large industrial plants and the United States Government.

Developments in Chilled Iron Wheels

The chilled iron wheel is beginning to supplant the European standards, according to George W. Lyndon, president of the Association of Manufacturers of Chilled Car Wheels. In an address which he made at a meeting of the association in New York, Oct. 12, he said that several manufacturers of the association are supplying chilled iron wheels in large quantities to the French and Russian governments. The address dealt with other phases of the chilled iron industry, in part as follows:

"That our flange recommendations are in the line of improvement is fully demonstrated by the fact that we have at the present time over 500,000 wheels running that are finding their way through the present track construction without any complaints. The flange used on special wheels is 3/32 in. thicker than the Master Car Builders' flange, and the flange as shown in our final argument is 3/16 in. thicker at the gaging point than the M. C. B. flange.

"It is our purpose to have a sufficient amount of metal in reserve in order to enable us to design a chilled iron wheel of 950 lb. or heavier; in other words, we are building for the future. We do not want the limits of the possibilities of the chilled iron wheel confined by the limitations of flange design. We want no unreasonable restrictions in the use of the chilled iron wheel.

"In March of this year we submitted to the chairman of the wheel committee of the M. C. B. Association a new set of standard specifications recommending the following:

650-lb. wheel, brake pressure 19,000 lb.
750-lb. wheel, brake pressure 32,200 lb.
850-lb. wheel, brake pressure 40,000 lb.
and detailed drawings of M. C. B. types of wheels and arch plate types of wheels."

Air Compressor Valve with Speed Adjustment

A flat plate valve for air compressors, which differs in design from those now on the market, has been developed by the Chicago Pneumatic Tool Company, Fisher Building, Chicago. The special feature of the valve is the provision of an automatic arrangement for varying the size of the opening according to the speed of operation. The valve consists of three independent concentric steel plates, one for each annular port. These plates are governed by their own springs only and the opening or closing of each valve is independent of the others. These valves are used both on the inlet and discharge sides of the compressor and with a view to preventing the reversal of the valves, the inlet valve is of lighter construction than the discharge. The variation in the amount of the valve opening is governed by the speed of operation. When the compressor runs at a slow speed only one plate of the valve opens, while as the rate of operation increases two plates open and when the full speed is obtained all of the plates open.

The Baltimore Drydocks & Shipbuilding Company, Baltimore, Md., has work enough to keep the present plant rushed to its capacity for at least 18 months. It would like to expand, but cannot because the necessary adjacent property cannot be secured. Because of its inability to secure additional ground for improvements, the company has been compelled to turn away a great deal of work.

Reports state that the Belgian steel plant, D'Ougrée-Marihaye, at Ougrée, has been able to operate only at intervals during the war with output much restricted; that the company, at great sacrifices, has supported its staff and contributed to the charitable funds and organizations in the Ougrée parish.

Exports of ferrovanadium from the United States in July, 1915, were 190,576 lb., compared with 14,696 lb. in July, 1914. For eight months to Aug. 1, 1915, they were 559,143 lb. against 397,437 lb. and 383,700 lb. to Aug. 1, 1914, and Aug. 1, 1913, respectively.

J. B. Doan Heads Machine Tool Builders

Annual Convention Well Attended Despite Labor Troubles—Notable Address by Retiring President Viall—Next Convention at Cincinnati

The National Machine Tool Builders' Association demonstrated its solidarity as never before when, despite strikes in tool-building shops in every manufacturing center at a time when order books are filled and buyers are clamoring for deliveries, a surprisingly large number of its members gathered at the Hotel Astor, New York, for the fourteenth annual convention, Oct. 28 and 29. Exactly 100 were registered. The problem of labor could not be forgotten; reference was made to it incessantly when men met, yet there was no gloom, and the meetings were as profitable as usual. It was not forgotten that there are greater achievements ahead, new problems to be handled, and despite the unfriendly attitude of labor, attention was given to plans formulated to give junior employees opportunity for advancement such as they never have enjoyed.

OFFICERS ELECTED

At the final session Friday afternoon the following officers were elected, the names having been submitted by the nominating committee:

President, J. B. Doan, American Tool Works Company, Cincinnati, Ohio.

First vice-president, D. M. Wright, Henry & Wright Mfg. Company, Hartford, Conn.

Second vice-president, A. H. Tuechter, Cincinnati Bickford Tool Company, Cincinnati, Ohio.

Treasurer, A. E. Newton, Reed-Prentice Company, Worcester, Mass.

Secretary, Charles L. Taylor, Taylor & Fenn Company, Hartford, Conn.

President Viall's annual address was optimistic, founded on a high plane, and made only passing reference to the labor troubles which are distressing at least a part of every branch of the industry. He sketched the business conditions of the past two years and pointed out the importance of the machine tool industry among those of the world. His address, substantially in full, is as follows:

RETIRING PRESIDENT VIALL'S ADDRESS

Looking over the work of this association during the past two years, one cannot but feel that we have been free from disturbances and from those cares which sometimes bear so heavily upon the officers and members of the association as such. As I look back into the period immediately preceding my taking of office and consider the immense amount of work that was done by the president, the legislative committee and those who worked with them so faithfully during the discussions on the tariff question, I feel that that was a period when the real strength and the real effort of the association were brought out most strongly.

Changing Conditions of Two Years

The period in which your president has been most closely interested has been one of a varying class of conditions. Business had begun to go off somewhat at

the time of our annual meeting in 1913, and the depression that had set in, affecting not only our own industry but all industries, had begun to deepen. At Worcester, April, 1914, we had one of the most successful gatherings as far as attendance and general interest were concerned, but you will remember that it was in a way trying, for we were all endeavoring to see the bright side and to estimate the time at which our business would take on a color that did not need rose-colored glasses to give it its proper shade. We all felt that business would revive at some time, but as to when it would revive was a serious question. We were putting up stock, and many had come to the point where they felt that they could not afford to increase the accumulation of stock goods.

At the October meeting, last year, some of us had begun to get rather busy, and we were very keen to follow all scents that led toward a discovery of persons holding orders. Few of us at that time had any idea of what was in store for us. Most of us were running short-handed, and the occasion had not yet arisen to warrant our adding to our forces and in many cases to our hours of operation.

At Atlantic City, this year, we met to find that all of our plants were in full swing—crowded in a way that we had never been crowded before—and that we were compelled to reject orders simply because we could not take care of our customers. This has continued until the present time.

We now find ourselves busily—hardly a section that is represented by our membership without distinctly disturbing elements in the way of labor troubles. As our organization, however, is one that is not concerned with the question of labor, but tries to confine itself to the commercial side of our industry, this question will not be dwelt upon at this time.

Through all of these changes, and oftentimes periods of dull business are more trying for an organization of this character to live through than are periods of prosperity, our membership has held together well. The various committees have worked together and have attained results that have been in keeping with the purposes of this organization; and while they are not matters that would appear large to the general public, the results are good enough for those interested to know that they have been of great importance to the branches of the industry interested.

Association Must Adhere to Purpose

At all times efforts are often made to interest the association and to exploit it in many enterprises which are not at all pertinent to our avowed purposes of organization. It has been the purpose of the officers to frown upon all such attempts, and it is to be hoped that future officers will also follow out this policy. It is an easy matter for an association of this character to extend its activities so that they will lose sight of their main objects.

I cannot refrain at this time from speaking of the work of the general manager—his uniform readiness, together with an optimism that has helped to bridge over many of the dull quarter hours that must come upon one who has this work much at heart; and more



First Vice-president D. M. Wright

than this, his willingness and readiness to work at any and all times has endeared him more strongly than ever to your president and, as a matter of fact, to all of our members.

At the time of the tariff discussions the point was brought out that our industry stood as a leading, if not the fundamental, industry among the industries of the world. The past few months have emphasized this most importantly. While it has been necessary to provide food and clothing for the armies, ammunition and arms have been entirely dependent upon machine tools, and we felt as much interest, or more, centering around the machine tool industry than around the direct manufacturer of the arms.

Industry's Opportunities for Young Men

Do we consider enough the variety of opportunities that exists in our industry in endeavoring to enlist the sympathy and help of young men of the class that we are talking of at this time? Men who have some mechanical taste and ability, combined with executive ability, find the broadest fields for work that is not only congenial but extremely profitable. There are opportunities for men who have distinct commercial proclivities when their tastes are mechanically inclined; and many times men who have made successes in other lines have allied themselves to our businesses and become most valuable men. It goes without saying that men of marked mechanical ability and inclinations have opportunities in our general lines that are second to none to establish themselves in kinds of work that are congenial and that will bring them rewards that are commensurate with their ability to work. Our industry needs more and more men who are good, clear thinkers; men who are able to consider the economic as well as the various mechanical questions that are coming before us, so that there is plenty of room for the varied talent that can be obtained.

We have been discussing at various times the question of interesting young men in our industry through apprenticeship, part-time schools, continuation schools, and so on. There is a line of attack that can be used in interesting young men, I believe, that, generally speaking, has not been made so much use of as is possible, and that is in placing before men who are making their decision as to the course they are to follow in life, a picture of what this industry stands for. In fact, it should be more than a picture—it should be a vision. As has been brought out many a time, our industry has been in the main started by men with little or no capital, and the results attained have been through the application of brains and of hard work that has brought the rewards as we now see them to-day. With very few exceptions, the men within the sound of my voice are men who have seen their businesses start from practically nothing and grow and expand to their present size, and did not step into concerns that were already going at the time they started their work.

There is no industry where honest work has a better showing than ours. To the honor of the industry it can be said to be a square one, for we do not attempt to sell goods that contain a percentage of less than 100 of the material that is claimed for them to contain. For the most part, we are dealing with men who know what they are buying and men who appreciate when good workmanship and good material are delivered to them, and well know when it is not.

Advantages Enjoyed by the Industry

It is doubtful if many of us appreciate our blessings and consider that we are dealing with men who know their business—a case so different from that of our automobile friends, who are obliged to deliver their highly organized machines into the hands of men that hardly know a screw-driver from a monkey-wrench.

The industry is one that is free from all the petty, trying questions of patents. Patents we have, and will have, but generally speaking they are not fundamental, so that the possession or lack of possession does not make or break the business, as is the case in some industries—and working industries at that—with which we come in contact.

At this time there are many who are interested in

welfare work, and by welfare work I do not mean any of the sentimental, useless work that is being done at times, but the class of work that tends to the help and the upbuilding of those who work for it and who are intended to be helped. Is there an industry where there are greater opportunities to come in first-hand touch with men who need guidance of this higher, non-parental type than in our industry, and where men can be developed on these lines which make them more useful to themselves and to the community at large?

I appreciate that many of these facts would not appeal to an ordinary workman, as his main efforts are to get through with as little work as possible and to stand ready to "do" his employer whenever opportunity arises; but it seems as though they would appeal—and in fact they do appeal—to some of the men who are looking about to settle themselves in work in which they can grow and make themselves useful.

PRELIMINARIES OF THE CONVENTION

After Mr. Viall had called the convention to order, the reading of the minutes of the last meeting was dispensed with, and the report of the membership committee was received. Six resignations were reported, the accumulation of two years. It was recommended that one member be dropped, and there were two applications for membership. The resignations were accepted. The application of the John B. Morris Machine Tool Company, Cincinnati, Ohio, was accepted by the committee, while the case of the other applicant was taken under consideration. In connection with applications for membership President Viall said the executive committee at a meeting held the previous evening had decided that these should be referred to the specific committees under whose jurisdiction the applicants would come, although it was in no way intended to interfere with the functions of the membership committee.

Convention committees were announced as follows:

Nominating Committee: P. G. March, Cincinnati Shaper Company, Cincinnati; E. J. Fullam, Fellows Gear Shaper Company, Springfield, Vt., and O. B. Iles, International Machine Tool Company, Indianapolis.

Auditing Committee: J. W. Carrel, Lodge & Shipley Machine Tool Company, Cincinnati; E. C. Woolgar, National Acme Mfg. Company, Cleveland, and A. H. Tuechter, Cincinnati Bickford Tool Company, Cincinnati.

Resolutions Committee: William Lodge, Lodge & Shipley Machine Tool Company; C. H. Alvord, Hendey Machine Company, Torrington, Conn., and T. C. Dill, T. C. Dill Machine Company, Philadelphia.

REPORTS OF THE OFFICERS

General Manager Charles E. Hildreth, Whitcomb-Blaisdell Machine Company, Worcester, Mass., said he was sure the members would excuse his not having prepared a formal report in view of the labor troubles, which he shared with others, and that he felt much like the child who did not want to give her name in school because the other scholars laughed at it. Questioned by the teacher, she said her name was Iona Ford. "I own a strike," said Mr. Hildreth, "but our president owns a bigger strike, yet he found time to prepare a good address." Mr. Hildreth said that never before had the association such opportunities for valuable achievement as at present. He believed relations established among the members by the association had enabled them to meet and grapple with the pressure of demand in recent months. Greater opportunities lie ahead, he said, especially in safeguarding the industry after the war is ended. The substitution of an anti-dumping clause for an amendment to the tariff law was something to be watched closely.

Mr. Hildreth took the members by surprise by

telling them they should find someone to take his place. He said the association was no longer a baby, and that a general manager was needed who could give his entire time to the work, which, as a business man, he could not do. He urged the members to give thought to business legislation. Mr. Viall said that it had been suggested by Mr. Hildreth that the association obtain the services of a professional manager, but that the executive committee favored a man actually a member of the industry. J. N. Heald, Heald Machine Company, related an incident where it was found better to have fifteen minutes of one man's time than an entire day of another, a situation which applied to Mr. Hildreth.

The report of Treasurer A. E. Newton, Reed-Prentice Company, Worcester, Mass., showed the finances of the organization to be in a flourishing condition.

Mr. Hildreth read a report of the association's co-operation with the Conference Board on Training Apprentices, other members of which are the United Typothetae and Franklin Clubs of America, National Association of Manufacturers, the National Founders' Association, and the National Metal Trades' Association. Several meetings of the board have been held since the spring meeting of the tool builders, when it was voted that the association co-operate with the board. Mr. Viall has been an ex-officio member of the board, and F. L. Eberhardt, Gould & Eberhardt, Newark, N. J., and R. E. Flanders, Jones & Lamson Machine Company, Springfield, Vt., have been acting with him. As set forth by the board, the purpose is as follows:

PURPOSE OF CONFERENCE BOARD

The Conference Board on Training of Apprentices is organized to promote co-operation among employers in training employees "for industry in industry" and to impress upon employers their peculiar responsibility in this respect: to stimulate the establishment in employments of effective apprenticeship systems for young people, based on co-ordinated trade training and technical instruction, and of specialized training courses for men and women; to devise plans and make recommendations to employers for the accomplishment of this purpose; and to co-operate with all public and private agencies engaged in effective preparation of young people for industrial life.

The report, in part, follows:

After very full discussions at the meeting on May 25, the following suggestions were generally agreed upon. Some of these suggestions are open to a good deal of discussion, and they are also subject to modification, depending upon the local conditions surrounding them. They are as follows:

RECOMMENDATIONS OF CONFERENCE BOARD

It was voted that a completed grammar school education or its equivalent should be made, where possible, a requirement for entrance upon an indentured apprenticeship.

The board felt that employers as citizens should join in the effort of educators to give each boy and girl such fundamental education as is comprised in a completed grammar school program; moreover, better and quicker results of mental and handicraft development during the apprenticeship can be secured on the basis of a completed grammar school education than on that of lesser educational preparation.

It was voted that all indentured apprentices should receive correlated classroom instruction either in classrooms established in the factory and managed by the employers, or in classrooms jointly established and managed by employers, or in public or private educational institutions under joint control of educators and employers.

It was voted that where possible classroom instructions should be given to apprentices during working hours, preferably for an hour or two every day, except during periods of summer vacation.

It was voted that where classroom instruction is given during working hours either in the shop or outside, apprentices should be paid the same wages during such time as they would receive if they were then engaged in their practical work.

The board believes that under such an arrangement apprentices will be eager to acquire technical knowledge, and on the basis of the consequent increased intelligence they will perform their practical work more intelligently and better for the stipulated wages than would otherwise be the case.

It was voted that apprentices should be paid only such wages as are stipulated in the Agreement of Apprenticeship, and should not be paid in addition thereto or in lieu thereof bonus or wages based on the piecework system.

The board felt that it might be permissible, and even advisable, from time to time to test out the working capacity of the apprentice by placing his work on the piecework system from the accounting standpoint, but it believes that payment of wages on the piecework plan during apprenticeship would tend to sacrifice accuracy for speed.

It was voted that an initial period of not less than 1000 and not more than 2000 working hours shall constitute a trial period for apprentices, and that the Agreement of Apprenticeship should not become fully effective until such trial period had been satisfactorily completed, but that the time of the trial period should be included in the full term of apprenticeship.

It was voted that in each employment where apprentices are being trained an expert should be selected to be responsible for the training and the conduct of the apprentice.

The board realizes that where a sufficient number of apprentices is employed in any one employment, a supervisor of apprentices should be selected to devote his whole time to this work, and that where only a few apprentices are being trained, the part time of a supervisor of apprentices may only be required. In this case, however, the supervisor should consider his work in connection with the training of apprentices a major function of his whole work and duty.

It was voted that apprentices should not be required to make any money deposit upon entering upon their apprenticeship, but that they should receive upon the satisfactory completion of their apprenticeship a cash bonus in the amount stipulated in the Agreement of Apprenticeship.

The board believes that no cash deposit on the part of the apprentices should be required as an incentive for their fulfillment of the Agreement of Apprenticeship, since many boys would be unable to make such deposit and might therefore be deprived of the apprenticeship training for which they are well fitted.

It was voted that the amount of the bonus to be paid to graduated apprentices should be at the rate of \$25 for each year of full apprenticeship.

Upon proper motion it was voted that the secretary should prepare a statement of recommendations, which, when approved by the members of the board individually, should be sent to employers to advise them in respect to various agreements of the board on matters of apprenticeship.

President Viall pointed out that many of the recommendations were subject to modifications where local conditions made changes necessary, and that the report was a worthy contribution to the subject. Incidentally he remarked that in his judgment there is no way to teach a man a trade or profession except by having him do the work. The trend of the times is toward developing the specialist, and they must come from men who have real training.

William Lodge said the recommendations differed considerably from the ideas of many of the members, and he would like to hear the views of others, but there was no response except from President Viall, who explained some of the conclusions reached by the board.

TRADE CONDITIONS IN CHINA

General Manager Hildreth has had some correspondence in times past with Frank A. Foster, Tientsin, China, a graduate of the Worcester Polytechnic Institute, who is desirous of seeing American machine tools introduced in China. A recent letter from Mr. Foster bears the date of Aug. 30 and was of such general interest that it was read by Mr. Hildreth. In part it follows:

War conditions have their reflections even in this far-distant land. The borrowing power of China in Europe has been cut off and that has had a natural tendency to turn her attention to developing her own resources, which, of course, is a good thing for China. The recent drastic action of Japan in her demands on China, another reflection of the war, has had a still further stimulating effect on native effort. A boycott of anything of Japanese origin has been started which is having a far reaching and disastrous effect on Japan's com-

merce. There does not appear to be any organized movement but it is rather a natural revulsion of feeling against a neighbor nation which, under the guise of friendship and desire for peace, stole all she could lay her hands on and threatened to come back for more.

Efforts are being made to produce in China those things which were before obtained from Japan. There are many inquiries going about as to the cost of installing and operating plants for manufacturing a great variety of goods. Although these may not materialize into orders in the immediate future, still they show a good spirit on the part of the Chinese. They seem to be getting the data together to be ready for action when the psychological moment arrives. At present the rate of exchange is so very high against China that very few will venture into buying abroad. Those industries which depend more on native resources are pushing ahead as well as could be expected.

By and by, if nobody has entered the field, the Chinese will be forced or encouraged to enter those fields which could be preempted for Americans.

SOME CHINESE SHOPS DESCRIBED

Since coming to Tientsin I have had a chance to get in better touch with commercial work. I have looked up all the machine shops I could find, both native and foreign. There are two British shops fitted to do fairly good sized work, such as steam engines, boilers, etc. These were working mostly on steam fittings for heating systems to be installed in some of the numerous large buildings being erected here. They report work very dull. A French shop in the French Concession was fitted up finely with good French machinery of all descriptions both for metal and wood work. They do general jobbing work with apparently a main line of plumbing goods. They were quite busy on a municipal contract. They seemed to be pretty enterprising while the British seemed to be the reverse, although I may be mistaken.

In the Japanese Concession I found a small Japanese shop which seemed to be pretty busy on steam engine and boiler work. Their methods were somewhat crude but ingenious.

In the British Concession I found a Chinese machine shop also working on power plants. They had perhaps a dozen English lathes, a few upright drills of a very crude type and a planer or two. Their methods were slow, crude and inefficient, although they seemed to be very busy. A somewhat smaller but more interesting Chinese shop was found in the Chinese city. There they had half a dozen lathes of an old English gap type. (In fact all the lathes I have seen here, except in the French shop, were of the English gap style.) In this shop they take all kinds of contracts, large or small and meet all emergencies with a great deal of ingenuity. The compound steam engine which drives this shop is of the proprietor's own design and make. His shop is lighted by electric lights from his own plant.

CRUDE FOUNDRY EQUIPMENT

All these shops have small foundries. In the Chinese places and in one of the British, they have the small Chinese cupolas holding less than a ton charge. These cupolas are about 4 ft. high and set on a sort of clay lined iron bowl mounted on trunnions and having the spout on the front. The blast is taken on the side above the trunnion. When the iron is ready to pour the whole cupola is tipped forward by a long lever at the back. The hand ladles are shallow and have wooden handles. In some cases the blast is obtained by a square piston blower worked by six or eight men stepping back and forward for a stroke of some 4 or 5 ft. They are quite skillful in making large thin cast-iron pans. I have seen pans 3 ft. in diameter so made that they were not over 1/16 in. thick at the center and tapering off evenly to 1/16 in. at the edges.

Besides these power-driven shops there are numerous small shops with two or three lathes, a crude drill or two and sometimes a planer. These are all driven by hand power consisting of a good husky cooke turning a crank on a counter-shaft having a heavy flywheel. In the case of the planers there is a shaft passing through the bed and geared to the bull wheel, reversing being done by the crank. In many places I have seen men and boys boring holes in thin material with the aid of a ratchet drill and "old man," holes that with a good upright drill would be finished by one or two turns of the feed wheel.

In these smaller shops they seemed to be making various textile machines of a simple character, especially foot power looms. I have seen fifteen or twenty of these shops and, no doubt, there are many more. The looms are used mostly locally in small mills of from ten to twenty looms, all hand or foot driven, making a good quality of narrow, figured and plain cotton goods. Another industry that has interested me is that of making files by hand. These shops are numerous.

PREPARATION FOR EVENTUAL OPPORTUNITIES

Taking up the matter of equipping a Chinese technical school with a good machine shop equipment, I hope the mat-

ter will not be forgotten when there comes a sufficient lull in war orders, and that it will be before the British get in their offer. There can be little doubt but that such a gift will be the best form of advertising that could be undertaken. If the time ever comes I shall be glad to do what I can to place it well.

It does not look very propitious for establishing agencies here just at the present time, on account of various conditions caused by the war. There are several firms which undertake to take orders for American machinery but they do not keep any stock or samples on hand. What is really needed here is to be able to show the goods and demonstrate the machines. It will go a great way towards filling the order book. It is up to the Americans to decide whether they will let this opportunity slip through their fingers or not.

ADDRESS ON SOUTH AMERICAN NEEDS

The association was addressed by W. C. Huntington, commercial agent of the Bureau of Foreign and Domestic Commerce, United States Department of Commerce, on business possibilities in South America. Mr. Huntington, who is in charge of the Chicago office of the bureau, reviewed a report which is to be made by J. A. Massel, special agent of the bureau, on an investigation made by the latter of trade conditions in the Argentine Republic, Chile and Peru. Mr. Massel was over a year in those countries and among other things has compiled lists of the dealers in machine tools in the three countries, all of which will later be available for American manufacturers. The report is now in process of editing and will be available not later than Dec. 15.

Mr. Huntington gave many statistics of the countries in question, told of their resources and of the extent to which England and Germany had held their trade. He said there had been an English period in South American trade, then a German period, and he was hopeful that an American period will follow. England had lost ground by relying too much on her control of the railroads in the Argentine and Chile, meanwhile becoming a little careless as to the wants of the people, also failing properly to support branch houses. In the Argentine Republic, Mr. Huntington said, the people were becoming a little irritated by the numerous committees who had come to their country to get acquainted, but whose visits had not been followed by more business. His personal view of the best method for the United States to increase its trade in South America is for several manufacturers in non-competing lines to open agencies in the principal cities, and at them carry a stock of their products. A well paid manager, understanding the language spoken should be in charge, while it would be easy to obtain native salesmen and mechanics.

The German houses all carried stocks and closely followed native customs, always having in view, however, the ultimate sale of a machine. It does no good to call the Latin Americans lazy, Mr. Huntington said, as their mode of living conforms with their point of view. He said, also, that there is room for all in South America, and that talk of forcing other nations out is ill-advised. Getting business there should not be comparable to a dog snatching a bone. Incidentally the speaker remarked that the South Americans know what they want and are good purchasing agents. The opportunity in the Argentine was almost exclusively for repair shop equipment, as agriculture is the one great industry.

Chile presents a better field in that it has need for hydro-electric and mining equipment. The selling overhead is large in South America, and this, Mr. Huntington argued, favored the co-operation

New American Iron and Steel Institute Members

Following is a list of new members elected at the session of the American Iron and Steel Institute held Oct. 22 in Cleveland:

ACTIVE MEMBERS

Edward H. Bindley, vice-president, Pittsburgh Steel Products Company, Pittsburgh, Pa.

Henry P. Bingham, assistant treasurer, Upson Nut Company, Cleveland, Ohio.

David A. Burt, treasurer, La Belle Iron Works, Steubenville, Ohio.

Harold T. Clement, assistant treasurer, Rogers-Brown Iron Company, Buffalo, N. Y.

Chauncey A. Cochran, second vice-president, Youngstown Iron & Steel Company, Youngstown, Ohio.

William C. Coffin, vice-president, Knox Pressed & Welded Steel Company, Pittsburgh, Pa.

Edward C. Collins, traffic manager, Pittsburgh Steamship Company, Cleveland, Ohio.

Albert L. Cromlish, superintendent blast furnaces, Carnegie Steel Company, Farrell, Pa.

Wilbert F. Davis, superintendent Bessemer and open-hearth departments, Cambria Steel Company, Johnstown, Pa. Isaac H. Denton, manager of sales, Ohio Seamless Tube Company, Cleveland, Ohio.

C. L. Gillespie, general superintendent, Texas Carnegie Steel Association, Galveston, Tex.

Ralph C. Glazier, superintendent blast furnaces, Cambria Steel Company, Johnstown, Pa.

William McK. Green, Cleveland-Cliffs Iron Company, Cleveland, Ohio.

Harry W. Haggerty, salesman, Corrigan, McKinney & Co., Cleveland, Ohio.

Erasmus B. Jones, salesman, Republic Iron & Steel Company, Cleveland, Ohio.

John H. Kennedy, manager, Rogers-Brown Iron Company, Buffalo, N. Y.

Harry J. Koch, secretary, Fort Pitt Steel Casting Company, McKeesport, Pa.

Maurice D. Langhorne, blast furnace superintendent, Puckles Iron Company, Pulaski, Va.

Roland S. LeBarre, assistant manager of sales, Carnegie Steel Company, Cleveland, Ohio.

John F. Lewis, assistant superintendent steel works, American Steel & Wire Company, Cleveland, Ohio.

Louis N. McDonald, superintendent Bessemer and open-hearth departments, Carnegie Steel Company, Youngstown, Ohio.

James S. McKesson, resident manager, Corrigan, McKinney & Co., Pittsburgh, Pa.

Alonzo C. Morse, general manager, Ohio Seamless Tube Company, Shelby, Ohio.

George W. Nichols, secretary, Stewart Iron Company, Ltd., Cleveland, Ohio.

David Z. Norton, Oglebay, Norton & Co., Cleveland, Ohio.

Claude J. Peck, manager Cleveland office, Shenango Furnace Company, Cleveland, Ohio.

B. E. Pheneger, superintendent blast furnaces, American Steel & Wire Company, Cleveland, Ohio.

Paul P. Reese, superintendent O. H. Nos. 1 and 2, Homestead Steel Works, Carnegie Steel Company, Munhall, Pa.

Edgar D. Rogers, general manager of sales, United Steel Company, Canton, Ohio.

William S. Rogers, assistant to president, Rogers-Brown Iron Company, Buffalo, N. Y.

Edwin G. Rust, general superintendent, Wheeling Steel & Iron Company, Wheeling, W. Va.

Ernest M. Sprague, contracting manager, American Bridge Company, Cleveland, Ohio.

H. B. Weatherwax, general superintendent, Chateaugay Ore & Iron Company, Albany, N. Y.

Robert B. Wolcott, sales agent, Carnegie Steel Company, Portland, Ore.

Charles L. Wood, sales department, Carnegie Steel Company, Pittsburgh, Pa.

Truman S. Woodward, chief chemist, Ohio Works, Carnegie Steel Company, Youngstown, Ohio.

ASSOCIATE MEMBERS

William H. Allen, superintendent, By-Products Corporation, Chicago, Ill.

Herbert A. Andresen, publisher, *The Blast Furnace and Steel Plant*, Pittsburgh, Pa.

A. O. Backert, vice-president, Fenton Publishing Company, Cleveland, Ohio.

T. F. Baily, president, Electric Furnace Company, Alliance, Ohio.

Merrill G. Baker, assistant general manager of sales, American Vanadium Company, New York City.

Clyde Brooks, secretary, Pittsburgh Iron & Steel Foundries Company, Midland, Pa.

Alexander C. Brown, vice-president, Brown Hoisting Machinery Company, Cleveland, Ohio.

Gilbert Butler, treasurer, Bossert Company, Utica, N. Y.

C. D. Caldwell, sales manager, Chicago, Ill.

David J. Champion, rivet manufacturer, Cleveland, Ohio.

Henry Chisholm, rivet manufacturer, Cleveland, Ohio.

Samuel G. Cooper, 1407 Oliver Building, Pittsburgh, Pa.

Frederick H. Eaton, president, American Car & Foundry Company, New York City.

L. H. Elliott, secretary, Bourne-Fuller Company, Cleveland, Ohio.

John N. Goddard, manufacturer, banker and merchant, Third National Bank Building, Atlanta, Ga.

William W. Hanlon, superintendent steel works, National Enameling & Stamping Company, Granite City, Ill.

Charles William Heppenstall, general manager and treasurer, Heppenstall Forge & Knife Company, Pittsburgh, Pa.

Wilson B. Hickox, Hamill-Hickox Company, Cleveland, Ohio.

Henry M. Kelly, manager, Lloyd-Booth Department, United Engineering & Foundry Company, Youngstown, Ohio.

Harry W. King, president, King Bridge Company, Cleveland, Ohio.

John Lambert, capitalist, Chicago, Ill.

John H. Long, salesman, United Engineering & Foundry Company, Youngstown, Ohio.

Clayton Mark, vice-president, National Malleable Castings Company, Chicago, Ill.

Domenico Martignone, electrical engineer, General Electric Company, Cleveland, Ohio.

Edwin H. Martin, metallurgical engineer and chemist, 1915 East Ninety-seventh Street, Cleveland, Ohio.

William J. Morris, president, Morris & Bailey Steel Company, Pittsburgh, Pa.

Gilston B. Morris, secretary, Morris & Bailey Steel Company, Pittsburgh, Pa.

Talbot E. Pierce, superintendent, Semet-Solvay Company, Cleveland, Ohio.

Henry F. Pope, president National Malleable Castings Company, Cleveland, Ohio.

Charles J. Ramsburg, vice-president, H. Koppers Company, Pittsburgh, Pa.

J. W. Richards, professor of metallurgy, Lehigh University, South Bethlehem, Pa.

E. Marshall Rust, engineer, Rust Engineering Company, Pittsburgh, Pa.

Robert R. Rust, general manager, Central Foundry Company, 90 West Street, New York City.

S. Murray Rust, engineer, Rust Engineering Company, Pittsburgh, Pa.

Mason H. Sherman, general manager, By-Products Corporation, Chicago, Ill.

Samuel L. Smith, vice-president, National Malleable Castings Company, Cleveland, Ohio.

Alfred H. Swartz, salesman, Westinghouse Electric & Mfg. Company, Pittsburgh, Pa.

E. L. Whittemore, chairman of the board, National Malleable Castings Company, Cleveland, Ohio.

John T. Wilkin, vice-president, Connersville Blower Company, Connersville, Ind.

William H. Woodin, assistant to president, American Car & Foundry Company, New York City.

Iron and Steel Safety Organization

An iron and steel section of the National Safety Council was organized on Oct. 22 in connection with the meeting of the National Safety Council. Reference to this fact was made in the general report of the meeting in the issue of Oct. 28. Like the foundry section, the iron and steel section will have its own officers and committees. The following officers were elected at the organizing meeting:

Chairman, J. M. Woltz, safety director, Youngstown Sheet & Tube Company, Youngstown, Ohio; vice-chairman, George T. Fonda, safety engineer, Bethlehem Steel Company, South Bethlehem, Pa.; secretary, Earl B. Morgan, safety engineer, Commonwealth Steel Company, Granite City, Ill.

The officers plan an immediate active campaign for membership, and those interested in safety in the iron and steel industry and allied manufacturing are asked to communicate with the secretary so that they may receive communications and papers as they are issued. There is no additional cost for membership to members of the National Safety Council.

A BRIEF ON MANAGEMENT

One Expert's Procedure in Introducing Scientific Management—Common Misconceptions

Some answers to the questions commonly asked when the subject of scientific management is mentioned are contained in the revised testimony, which has recently become available, of Carl G. Barth, consulting engineer, Philadelphia, before the lately deceased Federal Commission on Industrial Relations. Not because of the occasion of the evidence, but for the further illumination of a movement yet indifferently regarded in many quarters, parts of the testimony are given below. After some questioning, which Mr. Barth evidently thought would unduly lengthen the session to get before the commission his own views, he obtained consent to proceed on his own initiative substantially without interruption. From this statement the following has been taken, covering the main points:

STANDARDIZING MACHINE USAGE THE WORLD OVER

I have arrived at a certain ideal of what the machine equipment of a machine shop should be in respect to speeds and feeds. The value of this I have made it a part of my life work to get both the builders and the users of machine tools to realize, the former to keep it in mind in bringing out new designs. It implies nothing less than the final tuning, so to say, of all machine tools in the country; yes, in all the world, to conform to a common standard scale of speeds and feeds, so that, for instance, the drilling of a 1-in. hole in a certain grade of material might be done with the same speed and feed, in accordance with a standard practice, and hence in exactly the same time the world over.

To arrive at an approximation to my ideal in a shop, I often spend thousands of dollars in re-designing and rebuilding old machines that I find worth it, and never allow new machines to be bought and installed without fully investigating them and suggesting such changes as prove necessary to get them into at least approximate agreement with my ideal speed and feed series or scales. I insist upon unifying the machine equipment in a shop according to my ideas, before I undertake any time studies.

FIRST THING IN INTRODUCING SCIENTIFIC MANAGEMENT

Regarding the question asked a previous witness: "How do you go about introducing scientific management in a shop?" I like to answer for myself that I never go about it twice just the same way. Besides, I have long ago given up the idea of introducing a style or system of management in a shop. The initial step is usually to visit a plant and spend anywhere from one to five days looking it over, and then make a report on the conditions found. Conditions differ so widely, however, that it sometimes takes me longer to write the report than to look the plant over. One time I spent only three hours in a plant, and still saw so much that was bad that it took me three days to report on it all.

When I actually go to work, I try to tackle the matters that the management and I agree upon as most in need of first aid. Sometimes the method of purchasing, receiving, storing and issuing materials is so primitive and confusing that the most immediate good to both management and employees can be done by getting these matters in good shape, for in such shops an enormous amount of time is lost by jobs being assigned to men without the material being on hand. Sometimes it is the machinery that is so old and antiquated, or that has been so abused and neglected that it requires first attention. Again, it may be the drawings, or the lack of co-ordination of and co-operation between the various departments that cause the greatest trouble.

You will understand that as a rule the manager or employer is after his own interests first, and that we must look after that all the time, even if our own principal inclination and desire is to work for the benefit of the employees. However, I am happy to be able to state that I have two cases on my personal records of employers who have told me that they would be perfectly satisfied if my work would only enable them to pay their men higher wages, without yielding themselves any larger profits. One of these was Mr. James M. Dodge, who testified just ahead of me this morning, but who was too modest to refer to it himself. This was after we had been working at his company for a while, and at a time when the ultimate outcome appeared somewhat dubious.

THE COMMON NEGLECT OF SHOP MACHINERY

And now, as regards the machinery again, we often hear it stated that, while concerns take good care of their machines, they take none or but poor care of their men. This, however, is far from the truth, which is, that but few concerns with which I have been in touch have paid any attention to their machines until they become practically inoperative from abuse or wear. And I am sure that the economic loss to the country as a whole because machines are not kept in good repair is enormous and relatively fully as great as the loss due to workmen not being properly taken care of. If all the abused machines in the country could talk and complain of their treatment, there would be such a howl as the country has never heard before.

In going after the machinery, I, to the greatest possible extent, get at their defects through the operators themselves, whom I as a rule find to be more dissatisfied because they are unable to get even most glaring defects in their machines remedied, than because of their other treatment at the hands of their employers and foremen. This gives me an opportunity to get personally acquainted with a great many of them, and to show that I am only a very ordinary personality that does not claim or try to show any superiority, except in a certain kind of experience and knowledge that I am anxious to apply to make their work more pleasant, profitable and interesting; for the work in a machine shop that cannot be made interesting covers a very small percentage, indeed.

TEACHING WORKMEN THE NEW THINGS

In conducting some drilling machine tests I had a toolmaker assisting me in running the machine. At the end of our tests, which took some three weeks, all told, I said to him: "Mr. Blank, you now realize that you never really knew anything about drilling metals, while I am sure you thought you knew as much as anybody when we started in. For instance, when we first had trouble with the $\frac{1}{2}$ -in. drills in the hard steel block, the representative of the drill concern wanted me to reduce the feeds, and you agreed with him that it ought to be done; whereas the remedy proved to be a coarser feed. Is not that so?" And he admitted it; and for this reason I am going to ask the company to let me have this man for a speed and feed boss for the drill presses, when we reach the point where we have to have one, for left to himself the everyday mechanic will always reduce his feed and speed when he has trouble, whereas this man now knows from his own experience that the remedy often lies in the opposite direction.

Commissioner O'Connell: How about the non-producer?

Mr. Barth: We have no non-producers. I will not admit that for a second. We have indirect, as against direct workers. Because a man works in the office, and principally with his brains only, that does not make him less of a producer than the man who works in the shop and principally with his hands. Take my own case, for instance, there would quickly be a big scrap if anybody should come to me and call me a non-producer, working as I do, like the very devil, from early morning to late at night. You want to forget the antiquated distinction between the producer and the non-producer.

REDUCING THE VITALITY OF THE WORKER

Commissioner Weinstock: We would like to get your point of view and your opinion as to the objections that were raised on the part of the organized labor against scientific management. In the first place, the claim is made that scientific management increases productivity, but does it at the physical expense of the worker.

Mr. Barth: If it did, it would be wholly unscientific. It would not be scientific at all. No, as Mr. Taylor suggested yesterday, that would mean killing the goose that lays the golden eggs.

Commissioner Weinstock: From your experience and observation you would not admit that real scientific management means reducing the vitality of the worker?

Mr. Barth: I would just as soon admit that the moon is made of green cheese.

Commissioner Weinstock: The next charge that is made against it is that, while scientific management may temporarily increase the earning capacity of the worker, in the long run his earnings are reduced.

Mr. Barth: It has not run long enough to prove that. That is only guess work. Do not confound any particular plan for paying workmen with the Taylor system. I had to laugh yesterday when one of the commissioners asked a witness about the difference between the premium system and the Taylor system. He might as well have asked what the difference is between the earth and the universe. In connection with the Taylor system of scientific management, we may employ any one or all of these various methods of determining a man's pay, according as he performs or fails to perform the task set for him by the time study. The essential thing is to have such time studies made that a proper task can be set, and that is the cardinal point in the Taylor system. After that, it is a somewhat secondary matter which plan of payment is adopted, for when a task is performed in the exact task time, the man's pay will be the same on all plans. The difference shows up only when the task time is either appreciably exceeded or appreciably beaten by the worker. Besides these methods of paying, we sometimes also use straight piece work rates, but based on time studies and not on either guess work or past performances, which was always done previous to Mr. Taylor's adoption of time studies as the only fair basis of rate setting of any kind.

Copper in Germany

A writer for the *Elektrotechnische Zeitschrift* on "The Mobilization of Copper" says that unless the war lasts many years a shortage of copper in Germany will not be a determining factor in concluding the war. He estimates the stock of manufactured copper "in the hands of the public" at 2,000,000 tons. A good deal of this is in the form of copper roofing on public buildings. How soon this may be drawn upon is not stated, but on July 20, 1915, the War Metal Bureau ordered a register to be made of the copper held by certain sections of the public, including electricity and other works. The writer does not minimize the inconvenience already caused by the commandeering of all stocks of raw and partly manufactured copper, and says more drastic measures are not unlikely.

Through the efforts of the Greater Muskogee Association, the community organization of Muskogee, Okla., the city has voted \$350,000 in bonds to build and operate a pipe line to the adjacent natural gas fields for the purpose of furnishing gas to manufacturers at 4c. per 1000 ft. The city will be belted with an 8-in. line, which will be about 20 miles long. A main line will then be run through the heart of the gas field for a distance of about 30 miles with laterals. It is estimated that there is already developed enough gas to furnish 100,000,000 ft. a day to Muskogee. The field is not more than one-fourth developed and can be made to produce much more gas when necessary.

THE LEGISLATIVE PROGRAM

Measures Which the Congress Convening in December Will Consider

WASHINGTON, D. C., Nov. 2, 1915.—The Administration's legislative program to be submitted to the Sixty-fourth Congress, which will convene four weeks from next Monday, is practically completed. Besides providing for a liberal increase in expenditures for the national defense, it includes at least three important revenue bills, a project similar to the ship purchase measure defeated in the last Congress—possibly with a provision in the nature of a rider modifying the La Follette seaman's law—a bill legalizing combinations of American manufacturers and exporters for the exploitation of foreign trade and a measure of some kind penalizing the dumping of surplus foreign products on the American market. Influences are at work to induce the President to include in the program the so-called Stevens bill legalizing the fixing by manufacturers of the prices at which their products may be sold, but the President has come to no conclusion with reference thereto.

THREE REVENUE MEASURES

Three important revenue measures will be recommended by the Administration, two of them at the beginning of the session and one soon after the holidays. The first of these will be a joint resolution extending the emergency war revenue act, which expires Dec. 31, "until the end of the European war"; the second will be a resolution repealing that provision of the Underwood-Simmons act placing sugar on the free list May 1, 1916. These two resolutions will afford no additional revenue but will prevent a loss of something like \$150,000,000 per annum, which will automatically occur unless Congress takes prompt action. The third measure is a bill authorizing a bond issue. The exact amount of this issue cannot be foreshadowed for the reason that it is proposed to include not only the increased expenditures on account of the national defense but any shortage in the current revenues for the coming year which cannot comfortably be met from the cash balance in the Treasury.

There is no doubt that there will be a hard fight in both houses before the bond bill is put through, although the probabilities favor its ultimate passage. This measure will furnish a text for attacks upon the Administration's national defense policy and will probably line up all those who are determined to offer a last ditch opposition to the President's plans. As it is not proposed to issue the bonds authorized by this bill until after the beginning of the new fiscal year, July 1, 1916, the Administration is likely to defer pressing it upon the attention of Congress until the other important features of its legislative program are out of the way.

SHIPPING BILL AS PART OF DEFENSE PLAN

The new government shipping bill recently drafted by Secretary McAdoo is but a recasting of the original ship purchase bill beaten in the last Congress. As in the old bill, it is proposed that the government shall build merchant vessels for the foreign trade and operate them in its discretion, but it is added that all such ships shall be available for use as naval auxiliaries and shall be specially designed with this service in view. Secretary Daniels is co-operating with Secretary McAdoo in the effort to create sentiment in favor of this measure. There is every reason to believe that the opposition to it will be quite as strong as was encountered last winter.

THE ANTI-DUMPING ACT PROPOSED

The exact form that the legislation for penalizing of the dumping of surplus foreign products in United States markets will take has not yet been decided. It is believed that the actual drafting of the measure will be left to the House Judiciary Committee, which drew the Clayton bill. The framing of the anti-dumping law is a much more complicated proposition, however, especially in view of political considerations and the

rejudices of an influential element in Congress against any form of tariff legislation. The President is convinced, however, that a law of some kind should be enacted and will take an active part in the actual drafting of the measure.

Secretary Redfield, who was the first of the Administration officials to suggest the necessity for anti-dumping legislation, has been induced to abandon his original project to incorporate the substance of the Canadian law against dumping as an amendment to the Underwood-Simmons tariff act. In its place he has devised a measure which he will suggest as an amendment to the Clayton act or the act creating the Federal Trade Commission, treating the dumping of foreign products as "unfair competition." He has gone so far as to prepare a tentative draft of his proposed amendment as follows:

(a) It shall be unlawful for any person engaged in interstate or foreign commerce or industry, to sell or purchase articles of foreign origin or manufacture, in the sale of which the country of origin or elsewhere discrimination as to prices is made between different purchasers, where the prices to be paid for such articles by any American buyer, user, consumer, or dealer, after deduction of all charges incident to transportation, handling and entry, are materially below the current market rates for such articles in the country of production, or from which shipment is made to the United States, in case such prices substantially restrict competition on the part of American producers of similar or allied articles, or tend to create a monopoly in the sale of such articles in American markets.

(b) It shall be unlawful for any person engaged in interstate commerce or industry to buy, sell or contract for the sale of articles of foreign origin or manufacture, or to fix a price charged therefor, or rebate upon such price, conditioned upon the purchaser thereof not using or dealing in wares produced or sold by competitors of the manufacturer or seller, where the effect may be to substantially lessen competition in production in the United States of such articles, or tend to create a monopoly in the sale of such articles in American markets.

It hardly need be said that, compared with the direct and highly effective statute which Canada has enforced in the past eight years, Secretary Redfield's substitute is a cumbersome piece of legislative machinery of very doubtful efficiency. That the Secretary himself is not enthusiastic over this method of meeting the situation at will undoubtedly develop when the European war ends, indicates that the Administration will be ready at any time to accept a provision based on the Canadian law if the Congressional leaders will give their assent. It is significant that the leading majority members of the Ways and Means Committee in the new House voted, while the Underwood-Simmons bill was pending, for an amendment almost identical with the Canadian law.

PRICE MAINTENANCE BILL INDEFINITE

The President has not thus far added to his legislative program the Stevens price-maintenance bill although strongly urged to do so. Secretary Redfield is prone to habitual price cutting and to all forms of premiums, trading stamps and other gift devices to stimulate sales and it is believed that his influence will be exerted in favor of the Stevens bill. The Federal Trade Commission is making an investigation of the entire subject, however, and Secretary Redfield's endorsement of any legislative project with reference thereto is likely to be deferred until the Commission's conclusions are known.

W. L. C.

A precedent in industrial insurance or workmen's compensation liability is set by a decision of the Supreme Court of Wisconsin, in which it is held that an employer is liable for damages under the State compensation act for furnishing drinking water containing thus germs, death from such disease contracted in a manner being an "accident" within the meaning of the act.

The Sprague Electric Works of the General Electric Company has opened a sales office in the Provident Bank Building, Cincinnati, Ohio, under the management of Frank H. Hill. This new office has been established to facilitate the prompt and efficient handling of the company's increasing business in that section.

Carbon Steel Company's Report

At the recent annual meeting of stockholders of the Carbon Steel Company, Pittsburgh, Charles McKnight, president, submitted a report which is in part as follows:

While the business of the company for the first six months of the year was exceptionally poor on account of the conditions caused by the European war, business commenced improving about May and since that time the company has made up the loss in the first few months and earned a net profit on its business of \$191,847.88. After paying the interest on all bonds and bills payable and reserving \$16,256.73 toward an employees' special bonus fund, there has been carried to the surplus fund \$72,421.40, which leaves that fund at the present time with a credit balance of \$132,687.77. There has been a reduction, by the action of the sinking fund, of \$47,000 in the collateral trust notes and a reduction in bills payable during the year of \$112,580.14. The company has made during the year a number of additions to the mill, and has purchased a large amount of new tools and equipment which were needed, owing to the large increase in its business in the last six months of the year. Nearly all of these tools and improvements have been installed, and the mill is now in a good condition to carry out all contracts on hand.

In the fall of last year it was decided by the board of directors to send the president abroad in an attempt to secure business to keep the mill running. After being in England some time he secured an order from the British War Office for 75,000 4½-in. howitzer shells at a price which he felt would enable the company to make a fair profit. This contract is about two-thirds finished and will be completed about Jan. 1, several months ahead of the required delivery, and it is gratifying to the officers of the company that all shells, so far delivered under this contract, have been accepted by the British War Office without any rejections. The company has lately secured an additional contract with the British War Office, through its agents, J. P. Morgan & Co., for delivery of 4½-in. howitzer shells to the full capacity of its plant until July 1, 1916.

The officers estimate the principal contracts on the company's books at this time to be as follows:

Regular domestic business, about.....	\$1,769,360.00
Regular customers for steel for so-called war business, about.....	538,680.00
Shell forgings to be manufactured by the company or its sub-contractors, about.....	1,622,285.00
Finished shells, about.....	10,533,000.00

Or a total of orders on hand approximating \$14,463,325.00

This estimate does not include probable business which may follow the completion of present contracts, or orders which are not covered by contracts, received from day to day for the company's regular line of products, and this business is now showing a gradual improvement.

National-Acme Mfg. Company's Labor Affairs

On page 1030 in THE IRON AGE of Oct. 28 an incorrect statement was made regarding the labor affairs of the National-Acme Mfg. Company, Cleveland, Ohio. Instead of asking its employees to sign contracts to work the coming year at the present rate of wages on a 10-hr. basis, a card was given to each employee to sign which bore this statement: "The factory running time will be 10 hr. Saturdays, 5 hr. Overtime paid for at time and one-half. This is mutually satisfactory." This card makes no change from the established order of things with the company. The card was not a contract nor did the rate of wages enter into the proposition. The fact should be noted that the official running time for the week would be 55 hr. only, and that all time over that is overtime, which is paid for at time and one-half.

The company believes that until the recent labor unrest was started in Cleveland there was not a man in its employ who was dissatisfied. The agitation came wholly from the outside.

ESTABLISHED 1855

THE IRON AGE

EDITORS:

GEO. W. COPE

A. I. FINDLEY

W. W. MACON

CHARLES S. BAUR, *Advertising Manager*

Published Every Thursday by the DAVID WILLIAMS CO., 239 West Thirty-ninth Street, New York

W. H. Taylor, *Pres. and Treas.* Charles G. Phillips, *Vice-Pres.* Fritz J. Frank, *Secretary* M. C. Robbins, *Gen. Mgr.*

BRANCH OFFICES—Chicago: Otis Building. Pittsburgh: Park Building. Boston: Equitable Building. Philadelphia: Real Estate Trust Building. Cleveland: New England Building. Cincinnati: Mercantile Library Building.

Subscription Price: United States and Mexico, \$5.00 per year; single copy, 20 cents; to Canada, \$7.50 per year; to other foreign countries, \$10.00 per year. Entered at the New York Post Office as Second-class Mail Matter.

Important to Manufacturers

Extraordinary conditions will surround the work of preparing the annual naval, military and fortifications bills in the coming Congress. The suggestion has therefore been made in a high official quarter that manufacturers should make vigorous representations to their Senators and Representatives concerning the inadvisability of incorporating in those measures any prohibitions against the employment in Government establishments of the Taylor or any other system of scientific shop management. Never before has the necessity for prompt and energetic action been so urgent as at present, and failure to give adequate attention to the matter at this time is likely to have far-reaching consequences.

The determination of the Administration to ask an increase of approximately \$150,000,000 in the military and naval appropriations, a large part of which will be spent for material to be made either in Government or private shops, has spurred the labor leaders to employ extraordinary measures not only to hold the advantage gained at the last session but to improve it materially by extending the prohibitions incorporated in the army and navy bills to the fortifications bill and to increase the restriction in a drastic manner that will affect every private manufacturer doing Government work.

It is now proposed not only to provide in the three great budget measures, which this year will carry close to a half billion of dollars, a specific prohibition against the employment in Government establishments of the Taylor and all other systems involving time-studies and premium payments, but also to demand the enactment of a provision requiring the insertion in all Government contracts for ships, guns, forgings, and all other material, of a clause stipulating that none of the work shall be performed under these systems or in shops where they are in use. The germ of this idea originated in the campaign for an eight-hour day, which resulted in the restriction of work done by contract for the Government to establishments operating on the eight-hour basis. The object in view is both to deprive establishments employing scientific shop management of Government work and to create sentiment against the Taylor and other systems by putting the Government in the position of appearing to oppose them.

The necessity for independent action by private manufacturers to prevent further prohibitory legislation is in part due to the fact that the Chamber of Commerce of the United States, which some time ago authorized the appointment of a committee to deal with the subject, has become so burdened with other important tasks that it has been able to take no steps in the matter. The committee has not yet been appointed and it is regarded as unlikely that anything will be done before the committees of the House begin the drafting of the appropriation bills. It is essential, if these measures are to be carried through without the restrictions incorporated in the army and navy bills last year, that the committees should be impressed with the gravity of the present situation and any further delay is likely to prove fatal. The new Congress will organize Dec. 6 and Speaker Clark's new committee lists are understood to be fully made up and will be announced on the opening day. In the meantime sub-committees composed of members of the old committees on Military and Naval Affairs and Appropriations will prepare preliminary drafts on the new bills in which, in default of action by interested parties, they will incorporate the restrictions upon scientific shop management contained in the existing laws. The importance of early and vigorous action is therefore apparent.

The Small Shop and Safety Movement

If the rate of growth of the safety movement keeps up to that of the last few years, there is hope that the small plant will come under the influence. Though workmen's compensation legislation has been a big factor in giving more than a welfare basis for the activity, in some sections of the country a surprising indifference is shown. This attitude, it must be admitted, marks the employee more than the employer, but not uncommonly it exists where the employer makes no effort to afford the example and has not yet learned the importance of enlisting the interest of his foremen. If the chief in the shop look upon safeguards as fads and neither these nor higher executives take any part in shop safety committees, great respect for safety devices or obedience to safety rules cannot be expected.

The notion has not yet been dissipated that the

shop safety propaganda was fostered by employers solely for reducing costs of manufacturing. That any altruism was responsible is scouted. That some 1500 met recently in Philadelphia to discuss the detail problems cannot be widely brought to the attention of the rank and file of the shop workers. Had it been possible for them to participate in the gathering and absorb some of the earnestness of their safety specialists, they would realize how little of the mercenary there is in the work of such organizations as the National Safety Council.

One difficulty with the small shop is the initial outlay of money likely to be necessary to bring order out of chaos. The proprietor is so engrossed in making both ends meet and his limited capital so well occupied that he dismisses as impossible any large expenditure which is calculated to increase the cost of his product, already overloaded through inefficient methods and equipment. A shop given no attention as to safety is quite likely to be a shop in which no thought has been paid to efficiency. So, in spite of the fact that intimacy of contact between employer and employee would be expected to engender special considerations of safety, it has been left to the soulless corporations to take the lead. The great majority of those attending the Safety Councils Congress in Philadelphia were safety representatives of industrial corporations and from a survey of the personnel of the attendance, it does not seem that any company of even moderate prominence was without a delegate. A generosity to speak frankly of experiences, adverse as well as successful, characterized the more or less formal sessions and the interim informal gatherings, and it will be a truly paying investment in a plant not yet in line in the safety movement if some of its officers take advantage of the opportunity afforded by such a meeting to learn how others started in their work, met the special costs incident thereto, and earned a dividend both in money and esprit du corps.

The Alignment of Steel Prices

One of the interesting features of this very interesting steel market situation is the closeness with which finished steel prices are running together, making allowance for differences in the cost of manufacture. While the relative demand for the various steel products shows great divergences, all finished steel prices reflect the fact that these products are made from crude steel. It is the steel ingot or billet that is the commanding influence. Where differences exist in the amount by which various finished steel products have advanced lately, say in the past three or four months, they are usually to be attributed to the elimination, rather than the establishment, of abnormal relations. Thus since the middle of July sheets have advanced more than bars, plates and shapes, but in the fore part of July sheets were abnormally low, being indeed as low as they were at the beginning of the year.

As is often the case, it is the exception that tests the rule, and the fact that wire products and steel bars, for which there has been an altogether unprecedented demand, have advanced only slightly more than have finished steel products in general,

shows how strong is the leveling influence of what is commonly referred to as a shortage of unfinished steel.

The group composed of bars, plates and shapes is now almost established as a distinct market commodity, so regularly have the prices of these products moved in common, or so slight have been the divergences. In a half dozen years past the annual average quotation on plates has not been more than about 25 cents per ton above or below the average on structural shapes, and the commodities hold together now. Steel bars in the same time have averaged in the open market about \$1 per ton below plates and shapes, while now the extremely heavy war demand has done practically no more than wipe out this slight differential.

In a general way it may be observed that finished steel prices have now reached an average level fully equal to the top level attained on the rise of 1912, and approximately \$2 per ton below the top reached on the 1909 rise. Although the advances in wire products of late may have appeared somewhat exceptional, it is to be observed that wire nails are now only 5 cents per keg above the highest price reached in the 1912 movement, while they are on a level with the top reached in the preceding advance. Plain wire is \$2 and \$1 per ton respectively above the high points reached on the preceding advances, while painted barb wire shows excesses of \$4 and \$3 per ton respectively. No comparison can be made in the case of galvanized barb wire, as spelter has exerted an influence of its own in making galvanized products high priced at this time.

One very distinct divergence is found in billets intended for the manufacture of shells. They have been bringing what may certainly be designated as "fancy" prices of late, but it does not necessarily follow that the present spread between ordinary soft steel and war steel will continue. Many of the present makers are relatively new in the business, and many of the mills are distinctly oversold on this class of material. As time passes there will probably be a leveling influence which will make prices more nearly in accord with the cost of manufacture.

It can hardly be said that there is more than a nominal market for soft steel billets, but, in contrast with the high prices paid for billets of moderately high carbon made from ingots that have been chipped and rather severely cropped, the billet prices which producers regard as nominally representing the market are low rather than high, as compared with finished steel products. Thus bars, plates and shapes are now quotable at 1.50c., Pittsburgh, while in November and December, 1912, and the following January regular contract prices were 1.40c. for bars and 1.50c. for plates and shapes, the contract market on plates and shapes receding in February to 1.45c. In that month, however, Bessemer billets were quoted at \$28.50, Pittsburgh. Thus, at a time when finished steel prices were on the whole a trifle lower than at present, Bessemer billets reached a materially higher figure than has lately been regarded as the market. It is true that on the bulge of three years ago premiums were paid for small prompt lots of bars, plates and shapes, decidedly above the quotations cited above for com-

parison, but premiums are likewise obtainable now, at least for plates and bars.

Comparing the average prices for pig iron with the average prices for finished rolled steel products, it may be estimated that there is to-day \$2 per ton greater spread than obtained at the close of 1912, when the advancing movement of that year was about over.

In contrast with the fact that finished steel prices are as high as at the close of 1912, Connells-ville furnace coke contracts have been made for next year at an average of about \$2.25 per net ton at oven, while spot furnace coke has been bringing \$2.50 to \$2.75 of late. Three years ago contracts were made at \$3 to \$3.50 and spot coke brought \$4 and more.

Thus the condition at the moment is of prices for the various finished steel products hanging closely together, while there are unusual divergences between finished steel, billets, pig iron and coke. What the future will bring forth is another matter, for it is rather clear that the iron and steel market is disposed to move along new lines without much regard for precedent.

American Shipbuilding Company's Year

The sixteenth annual report of the American Shipbuilding Company states that the earnings in the fiscal year ended June 30, 1915, before deducting maintenance and depreciation, were \$175,770.46, and the net income was \$5,405.63. The previous year's figures were \$712,061 and \$2,804, respectively. The depression of 1913-14 was thus intensified in 1914-15.

In making up the balance sheet this year adjustments of property and good-will accounts, etc., reduced the surplus \$2,965,828.88, making it stand on June 30, after adding the year's net income, at \$2,971,234.51, against \$5,441,235.23. The report explains this as due to the anticipated concentration of certain plants, necessitating the discontinuing of some and the sale of real estate parcels not necessary to the business of the company. Regarding the deduction for good-will from surplus, "the board directed the entry, having in mind the elimination from good-will of all items except such as are represented in the capital stock of the companies now in operation." The balance sheet, as of June 30, condensed, compares as follows:

	Assets	1915	1914
Plants and property	\$9,472,765	\$12,056,239	
Good-will and patents	5,489,515	6,684,292	
Investments	2,007,389	1,873,208	
Material, supplies and scrap	537,278	530,331	
Uncompleted contracts	49,030	4,959	
Notes receivable	357,252	508,108	
Accounts receivable	575,352	1,060,126	
Accrued interest	24,154	7,751	
Cash on hand and in bank	390,391	587,759	
Advance to subsidiaries	402,010	351,597	
Deferred charges	10,857	57,743	
Total	\$19,315,994	\$23,721,736	
Reserve for doubtful accounts	105,868	91,061	
Total	\$19,210,126	\$23,630,675	
	Liabilities		
Common stock	\$7,600,000	\$7,600,000	
Preferred stock	7,900,000	7,900,000	
Funded debt	200,000	250,000	
Notes payable	200,000	500,000	
Accounts payable	106,955	172,851	
Accruals, taxes	95,165	62,125	
Liability insurance	1,757	3,241	
Reserve for maintenance	12,165	428,117	
Reserve for uncompleted construction	122,449	19,058	
Reserve for bond discount	1,224,449	10,000	
Reserve for fire insurance	2,971,234	103,583	
Real estate, buildings, dry docks, etc.	1,137,461		
Profit and loss surplus	5,441,235		
Total	\$19,210,126	\$23,630,675	

The report states that for reasons of economy the Cleveland plants are being centralized on the company's property adjoining its dry docks and shipyard, at the foot

of West Fifty-fourth Street, where there are under construction, for completion this fall, buildings for the general office and engineering department, machine shop, foundry and pattern shop. The North Chicago plant is being dismantled, equipment moved to South Chicago, and real estate is offered for sale. There is under construction at South Chicago, for completion this fall, a dry dock 700 ft. long, 103 ft. wide and 16 ft. deep over the sill. The yard at Superior, Wis., which is fully equipped for construction and dry dock work, is now undergoing changes whereby its several isolated units will be brought into close relation, permitting more efficient and economical operation.

From the accompanying remarks of President Edward Smith the following extracts are taken:

"The fleets of the Great Lakes suffered from the previously existing depression until after the opening of navigation this spring, and not until after the close of this fiscal period did conditions improve sufficiently to place in condition the entire fleet of bulk carriers. With this depression among the carriers, their business with the shipyards was naturally reduced to a minimum. Under these conditions the Great Lakes offered no encouragement for the employment of capital in new construction, the amount of which at all our yards for the entire year was limited to one 10,000-ton ship of the self-unloading type constructed at Lorain, Ohio. Realizing the discouraging local conditions, active but unsuccessful endeavors have been made to secure some salt-water tonnage, in which we are at a disadvantage, due to the limitation of the size of vessels capable of passage through the Canadian canal locks.

"Owing to these unfavorable conditions, the company has this year experienced the smallest volume of business in its history and it is only by the exercising of strict economy that we are able to maintain the financial condition of the company in its present satisfactory condition.

"Prospects now indicate profitable employment of all bulk carriers on the Great Lakes, which, if continued reasonably long, will enable owners to make any deferred changes and repairs and probably create a demand for some new tonnage, the amount of which will be small in comparison with previous years. For these reasons the prospects for the coming year, while not particularly encouraging, are better than one year ago."

Locomotive Orders Still Increasing

Orders for 140 locomotives are reported in the past week, in addition to the 80 announced a week ago. The Baldwin Locomotive Works will build 75 locomotives for the Pennsylvania Railroad, 30 for the Atchison, Topeka & Santa Fé, 2 for the Erie, 10 for the Philadelphia & Reading and 3 for smaller roads. The American Locomotive Company has contracted with the Chesapeake & Ohio for 10 locomotives, with the Minneapolis & St. Louis for 5 and with the Maine Central for 2, besides minor orders for 3. The Cincinnati, Indianapolis & Western will award orders for 42 locomotives in a week or 10 days. October orders, however, are estimated as below normal.

Manufacturers to Discuss Tariff

The Illinois Manufacturers' Association has invited representatives of manufacturers throughout the country to meet at the Congress Hotel, Chicago, Dec. 7, to discuss the problem of tariff revision. The conference is under the direction of a committee, of which B. A. Eckart is chairman. The Chicago address of the Illinois Manufacturers' Association is 76 West Monroe Street.

The enlargement and reconstruction of the plant of the Alton Steel Company, Alton, Ill., recently taken out of receivers' hands, will begin at once. Considerable new equipment will be installed. It is expected to have the plant in operation by Jan. 1.

The American Steel Foundries, Indiana Harbor, Ind., is about to add to its plant a building 200 x 320 ft.

OPTION ON THOMAS IRON CO.

Wharton and Other Eastern Blast Furnaces Also Sought

By the unanimous vote of the 35,000 shares represented, cast by about 200 stockholders attending the special meeting held at Hokendauqua, Pa., Oct. 27, it was decided to give an option on the Thomas Iron Company stock to the interests represented by Mills L. C. Kachelmacher of Logan, Ohio. It had been announced before the meeting that the persons seeking to acquire the company had offered \$45 a share for the 50,000 shares, the capital stock being \$2,500,000. However, Philadelphia interests represented by Frazier & Co., bankers, later made an offer of \$50. This led those who originally sought the property to increase their offer to \$55 a share.

The associates of Mr. Kachelmacher in this effort to secure Eastern blast furnace properties are not named as yet, though there are well-defined reports as to the identity of some of them. It is understood that the same interests secured a short time ago an option on the Wharton Steel Company furnaces at Wharton, N. J., and the Wharton iron ore properties in New Jersey, the apparent purpose being to organize a large Eastern blast furnace company. It is known that they approached another eastern Pennsylvania blast furnace company with a proposition for an option on its property. This, however, has not been acted upon and may not be.

It does not appear as yet that any steel making interest is involved in the negotiations, but mention is made of a possible Eastern iron ore connection. The Thomas Iron Company owns seven blast furnaces, of which two are at Hokendauqua, one near Easton, Pa., two at Alburtis and two at Hellertown, Pa. The company also owns railroads connected with its iron mines and limestone quarries. The Richard iron mine at Wharton, N. J., has shown improvement both in quantity and quality of ore under the work of the past two years and the company has other iron mines in Lehigh and Berks counties. Under the administration of President R. H. Sweetser its properties have been improved and its position strengthened.

Of the three Wharton furnaces, Nos. 2 and 3 are 100 x 21 ft. and have modern equipment. The No. 1 furnace is 75 x 17 ft. The Wharton iron mines are located near Wharton, N. J., the Hibernia being the principal property. Connected with it are plants for magnetically concentrating the ore. The amount of available magnetite ore represented in the Wharton mines and ore lands has been estimated at 30,000,000 tons.

Donner Interests and Pennsylvania Steel Company—Other Negotiations

Philadelphia newspapers have published the statement in the past week that William H. Donner, president of the Cambria Steel Company and chairman of the board of the Pennsylvania Steel Company, has exercised his option to purchase from the Pennsylvania Railroad and the Philadelphia & Reading one-half of their holdings of the common and preferred stock of the Pennsylvania Steel Company. This, it was stated, would give the Donner interests control of the company. Though details are not available, the statement is made that while C. M. Schwab, representing the Bethlehem Steel Company, had made an offer for the two railroads' holdings in the Pennsylvania Steel Company, which seemed likely to be accepted and to give Bethlehem control of the Pennsylvania Steel Company, Mr. Schwab had finally withdrawn as a possible purchaser of the property.

CONTENTS

Materials Employed in Case Hardening	1041
Antimony and the War	1042
System and Its Abuse	1043
Brass Furnaces Conveniently Arranged	1044
Steam Generation from Waste Heat of Kilns	1044
Shells of the Calibers Now in Service	1045
Atomizing Fuel Oil	1049
Pennsylvania State Employment Bureau	1050
Australian Metal Contracts	1050
The Ford Company's Process	1051
A Bulletin on Titanium Rails	1051
Germany's August Steel Output Highest of the War	1051
Heat Losses from an Electric Furnace	1052
Castings from Blast Furnace	1054
The X-Ray in Metallurgical Research	1054
Power Operated Multi-Basket Strainer	1055
Brittleness in Steel	1056
The Three Position Plan of Promotion	1057
Developments in Chilled Iron Wheels	1059
Air Compressor Valve with Speed Adjustment	1059
J. B. Doan Heads Machine Tool Builders	1060
New American Iron and Steel Institute Members	1064
Iron and Steel Safety Organization	1064
A Brief on Management	1065
Copper in Germany	1066
The Legislative Program	1066
Carbon Steel Company's Report	1067
National-Acme Mfg. Company's Labor Affairs	1067
Important to Manufacturers	1068
The Small Shop and the Safety Movement	1068
The Alignment of Steel Prices	1069
American Shipbuilding Company's Year	1070
Locomotive Orders Still Increasing	1070
Manufacturers to Discuss Tariff	1070
Option on Thomas Iron Co.	1071
Donner Interests and Pennsylvania Steel Company—Other Negotiations	1071
The Foundry Exhibit at Cleveland in 1916	1071
Pig-Iron Production for October, 1915	1072
Blast Furnace Notes	1073
The Iron and Metal Markets	1074
Manganese-Ore Supplies Increasing	1086
Program of Mechanical Engineers' Annual Meeting	1087
Youngstown Sheet & Tube Buys Equipment	1087
Large Exports of Motor Cars	1087
Personal	1088
Federal Furnace Company Taken Over	1088
Pittsburgh and Nearby Districts	1088
Obituary	1089
Cleveland Machinists Call Off Strike	1089
Labor News of New England	1090
W. P. Davis Machine Company Purchased	1090
Manganese Ore from Virginia	1090
Ferromanganese Imports Below Normal	1090
Machinery Markets and News of the Works	1091
Machining Projectile Shells	1099
Jolt and Squeezed Molding Machine	1100
Ore Sintering Apparatus	1102
Oxy-Acetylene Welding and Cutting Torch	1102
Cost of Compensation in Wisconsin	1102
Making Practically Pure Iron	1102
Reclaiming Used Lubricant	1103
Banding and Nosing Press for Shrapnel	1104
New Air Compressor of the Portable Type	1104

Unconfirmed reports have come out in the past week that offers have been made for control of the Eastern Steel Company, whose open-hearth and structural steel plant is located at Pottsville, Pa., and which has a long lease of the Warwick Iron & Steel Company furnaces at Pottstown, Pa. This report has been published before, but has appeared in the past week in more circumstantial form.

Among other reports of pending deals for the acquisition of iron and steel properties or companies is one concerning offers for a majority of the stock of an important steel company in the Chicago district.

The Foundry Exhibit at Cleveland in 1916

At a recent meeting of the executive committee of the American Foundrymen's Association at Cleveland it was decided to receive bids for the conduct of the exhibition of foundry machinery and supplies which will be held in connection with the convention at Cleveland next year. For several years the exhibition has been under the control of the Foundry & Machine Exhibition Company. It is understood that bids are to be opened Nov. 13 at Cleveland, and that the successful bidder will manage the exhibition for the foundrymen, the net profits to go to the associations and the exhibitors.

Over 3,100,000 Tons of Pig Iron in October

For the first time in the history of the industry, pig-iron production in the United States passed the 3,000,000-ton mark in October. At the opening of the month statistics showed that production was proceeding at the rate of 36,000,000 gross tons a year. Further additions to the list of active furnaces were made as the month advanced. Returns received largely by wire show that the output of coke iron in the 31 days of last month reached the altogether unprecedented figure of 3,125,491 tons, or 100,822 tons a day against 2,852,561 tons in September, or 95,085 tons a day. Thus for the first time the daily output of pig iron runs into six figures. The steel companies produced at the rate of 73,595 tons a day, their total for the month being 2,281,456 tons, or more than twice that of January. The merchant furnaces also gained, their daily rate being 26,227 tons, against 24,108 tons in September.

There was a net gain of eight in active furnaces last month, or from 268 to 276 furnaces, and the capacity active Nov. 1 was 101,819 tons a day, against 97,535 tons a day on Oct. 1. Estimating charcoal iron, pig iron was being made on Nov. 1 at the prodigious rate of 37,500,000 tons a year, against a rate of 36,000,000 tons a year one month previous.

DAILY RATE OF PRODUCTION

The daily rate of production of coke and anthracite pig iron by months, from October, 1914, is as follows:

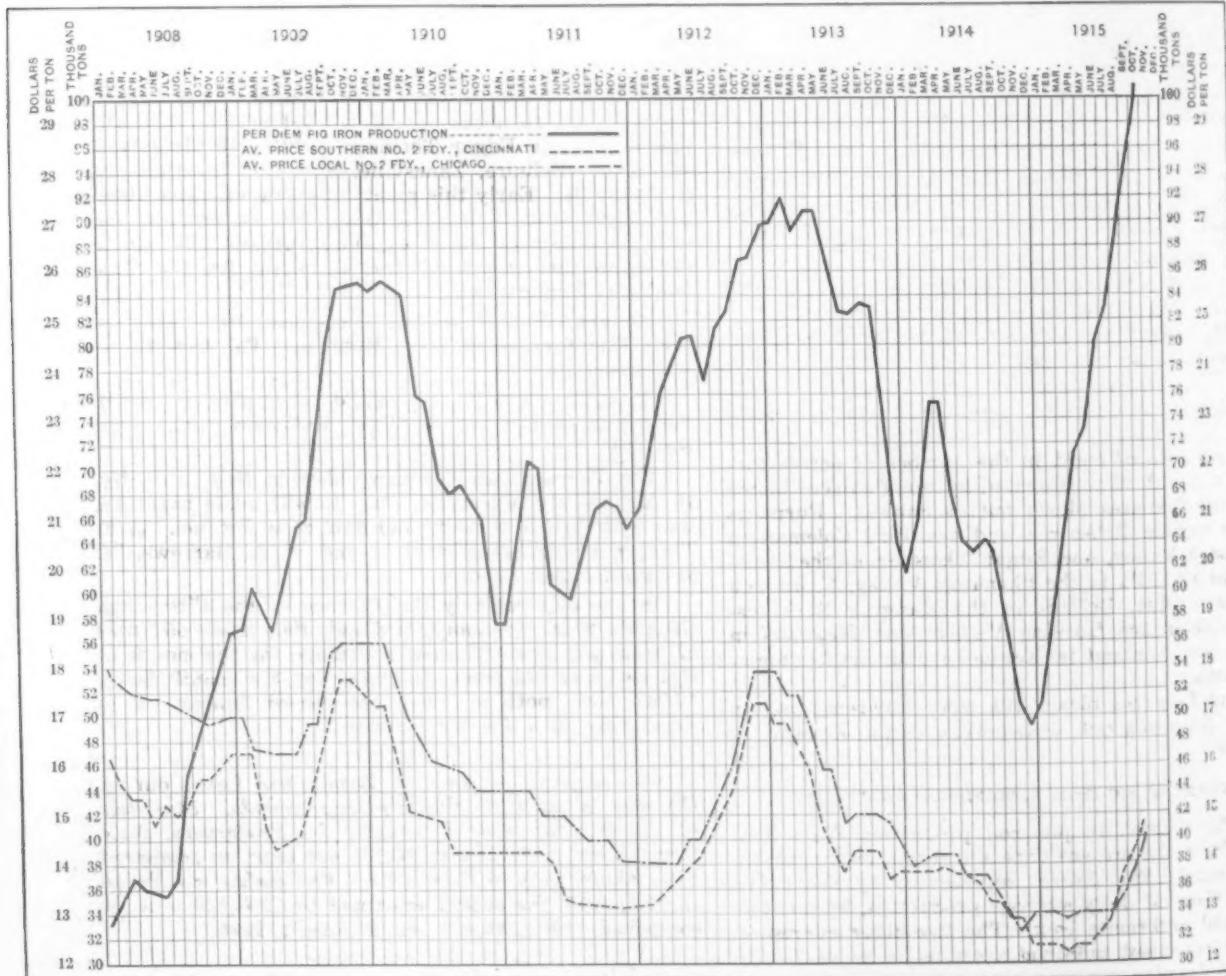
Daily Rate of Pig-Iron Production by Months—Gross Tons		
	Steel works	Merchant
October, 1914	41,026	16,335
November	35,305	15,306
December	33,381	15,515
January, 1915	35,998	15,661
February	44,192	15,621
March	50,036	16,539
April	52,804	17,746
May	54,655	18,360
June	59,022	20,339
July	62,895	19,796
August	67,801	21,865
September	70,977	24,108
October	73,595	26,227
		100,822

OUTPUT BY DISTRICTS

The accompanying table gives the production of all coke and anthracite furnaces in October and the three months preceding:

Monthly Pig-Iron Production—Gross Tons

	July (31 days)	Aug. (31 days)	Sept. (30 days)	Oct. (31 days)
New York	178,545	196,426	190,449	195,852
New Jersey	5,961	6,800	6,232	3,703
Lehigh Valley	76,683	87,555	100,714	116,086
Schuylkill Valley	49,985	69,042	64,988	85,028
Lower Susquehanna and Lebanon Valley	30,422	31,966	35,294	56,702
Pittsburgh district	668,500	699,921	700,248	773,715
Shenango Valley	134,742	133,249	144,224	169,294
Western Pennsylvania	160,294	164,777	184,596	173,428
Maryland, Virginia and Kentucky	38,671	45,145	60,247	70,946
Wheeling district	100,782	112,294	114,031	116,763
Mahoning Valley	295,679	310,426	305,864	315,399
Central and Northern Ohio	196,620	224,222	214,452	240,979
Hocking Valley and Hanging Rock	22,377	25,904	33,072	47,648
Chicago district	352,601	406,508	436,794	450,978
Mich., Minn., Mo., Wis. and Col.	71,340	69,628	75,731	79,810
Alabama	165,403	180,559	190,676	212,733
Tennessee	14,815	15,225	15,249	16,427
Total	2,563,420	2,779,647	2,852,561	3,125,491



The New High Mark in American Pig Iron Output—A Daily Rate of 100,822 Gross Tons

Diagram of Daily Average Production by Months of Coke and Anthracite Pig Iron in the United States, from Jan. 1, 1908, to Nov. 1, 1915; Also of Monthly Average Prices of Southern No. 2 Foundry Iron at Cincinnati and Local No. 2 Foundry Iron at Chicago District Furnace

PRODUCTION OF STEEL COMPANIES

Returns from all furnaces of the United States Steel Corporation and the various independent steel companies show the following totals of product month by month. Only steel-making iron is included in the figures below, together with ferromanganese and spiegeleisen. These last, while stated separately, are also included in the columns of "total production."

Production of Steel Companies—Gross Tons

	Spiegeleisen and ferromanganese				
	1913	1914	1915	1914	1915
Jan.	1,981,560	1,261,430	1,115,944	15,633	17,325
Feb.	1,792,154	1,329,414	1,237,380	20,131	10,524
Mar.	1,904,878	1,704,688	1,551,082	20,546	20,133
Apr.	1,939,751	1,633,226	1,584,111	23,108	18,676
May	1,991,192	1,457,847	1,694,290	19,042	21,504
June	1,860,070	1,329,623	1,770,657	19,212	16,254
July	1,840,216	1,395,851	1,949,750	28,310	16,524
Aug.	1,833,352	1,455,054	2,101,818	20,680	11,577
Sept.	1,828,232	1,390,322	2,129,322	24,555	13,786
Oct.	1,848,634	1,271,820	2,281,456	19,499	17,435
Nov.	1,573,007	1,059,159	.....	26,765	21,977
Dec.	1,298,262	1,034,802	.....	14,095	20,733

CAPACITY IN BLAST NOV. 1 AND OCT. 1

The following table shows the daily capacity in gross tons of furnaces in blast Nov. 1 and Oct. 1 by districts:

Coke and Anthracite Furnaces in Blast

Location of furnaces	Total number of stacks	Nov. 1		Oct. 1	
		Number in blast	Capacity per day	Number in blast	Capacity per day
<i>New York:</i>					
Buffalo	12	16	5,686	16	5,766
Other New York	7	3	632	3	622
New Jersey	7	1	119	1	208
<i>Pennsylvania:</i>					
Lehigh Val.	22	12	3,526	12	3,352
Spiegel	2	2	219	2	204
Schuylkill Val.	15	8	2,703	8	2,470
Lower Susquehanna	7	4	1,353	4	1,095
Lebanon Val.	10	3	556	1	249
Pittsburgh Dist.	52	50	24,866	49	23,021
Ferro	4	3	323	3	362
Shenango Val.	19	17	5,710	16	5,607
Western Pa.	24	16	5,539	16	5,431
Ferro	1	1	56	1	56
Maryland	3	2	854	2	888
Ferro	1	1	114	1	113
Wheeling Dist.	11	10	3,850	10	4,115
<i>Ohio:</i>					
Mahoning Val.	25	22	10,310	22	10,185
Central and Northern	24	18	7,765	17	7,148
Hocking Val. & Hanging R'k.	15	9	1,410	8	1,284
Ill. and Ind.	35	29	14,486	30	14,590
Ferro	1	1	62	0	0
Michigan, Wis. & Minn.	10	7	1,971	7	1,866
Colo. and Mo.	7	2	752	2	658
<i>The South:</i>					
Virginia	24	7	.925	6	725
Kentucky	5	3	622	2	420
Alabama	46	24	6,895	23	6,460
Tennessee	20	5	515	6	640
Total	416	276	101,819	268	97,535

The net gain of eight in the number of active furnaces last month is represented by ten furnaces blown in and two furnaces blown out or banked. Furnaces blown in include Robesonia and one Bird Coleman in the Lebanon Valley, one Edgar Thomson in the Pittsburgh district, Ella in the Shenango Valley, Newburgh in northern Ohio, Belfont in the Hanging Rock district, Bessie in the Hocking Valley, Max Meadows in Virginia, one Ashland in Kentucky and one Bessemer in Alabama.

Among furnaces blown out were Lawrence in the Hanging Rock district (banked) and La Follette in Tennessee.

DIAGRAM OF PIG-IRON PRODUCTION AND PRICES

The fluctuations in pig-iron production from January, 1908, to the present time are shown in the accompanying chart. The figures represented by the heavy lines are those of daily average production, by months, of coke and anthracite iron. The two other curves on the chart represent monthly average prices of Southern No. 2 foundry pig iron at Cincinnati and of local No. 2 foundry iron at furnace at Chicago. They are based on the weekly market quotations of THE IRON AGE. The figures for daily average production, beginning January, 1908, are as follows:

Daily Average Production of Coke and Anthracite Pig Iron in the United States by Months Since Jan. 1, 1908—Gross Tons

	1908	1909	1910	1911	1912	1913	1914	1915
Jan.	33,918	57,975	84,148	56,752	66,384	90,172	60,808	51,659
Feb.	37,163	60,976	85,616	64,090	72,442	92,369	67,453	59,813
Mar.	39,619	59,232	84,459	70,036	77,591	89,147	75,738	66,575
Apr.	38,289	57,962	82,792	68,836	79,181	91,759	75,663	70,550
May	37,603	60,753	77,102	61,079	81,051	91,039	67,506	73,015
June	36,444	64,656	75,516	59,585	81,358	87,619	63,916	79,361
July	39,287	67,793	69,305	57,841	77,738	82,601	63,150	82,691
Aug.	42,851	72,546	67,963	62,150	81,046	82,057	64,363	89,666
Sept.	47,300	79,507	68,476	63,903	82,128	83,531	62,753	95,085
Oct.	50,554	83,856	67,520	67,811	86,722	82,133	57,361	100,822
Nov.	51,525	84,917	63,659	66,648	87,697	74,453	50,611	.....
Dec.	56,158	85,022	57,349	65,912	89,766	63,987	48,896	.....

THE RECORD OF PRODUCTION

Production of Coke and Anthracite Pig Iron in the United States by Months Since Jan. 1, 1911—Gross Tons

	1911	1912	1913	1914	1915
Jan.	1,759,326	2,057,911	2,795,331	1,885,054	1,601,421
Feb.	1,794,509	2,100,815	2,586,337	1,885,670	1,674,771
Mar.	2,171,111	2,405,318	2,763,563	2,347,867	2,063,834
Apr.	2,064,086	2,375,436	2,752,761	2,269,655	2,116,494
May	1,893,456	2,512,552	2,822,217	2,092,686	2,263,470
June	1,787,566	2,440,745	2,628,565	1,917,783	2,380,827
July	1,793,068	2,410,889	2,560,646	1,957,645	2,563,420
Aug.	1,926,637	2,512,431	2,545,763	1,995,261	2,779,647
Sept.	1,997,102	2,463,839	2,505,927	1,882,577	2,852,561
Oct.	2,102,447	2,689,933	2,546,261	1,778,186	3,125,491
10 mo.	19,289,008	23,969,899	26,507,371	20,015,684	23,421,936
Nov.	1,999,433	2,630,854	2,233,123	1,518,316	.....
Dec.	2,043,270	2,782,737	1,983,607	1,515,752	.....
Total, yr.	23,331,711	29,383,490	30,724,101	23,049,752	.....

Blast Furnace Notes

LaFollette Iron Company, LaFollette, Tenn., blew out its furnace for relining Oct. 28.

Lawrence furnace of the Marting Iron & Steel Company, Ironton, Ohio, was banked on Oct. 29.

The Ashland Iron & Mining Company, Ashland, Ky., blew in its No. 2 furnace Oct. 29. The No. 1 furnace has been in operation since early September.

The No. 1 furnace of the American Manganese Mfg. Company at Dunbar, Pa., continues to produce 80 per cent ferromanganese. At the No. 2 furnace the work of relining has been almost completed.

On Nov. 1 the Carnegie Steel Company was operating 49 blast furnaces out of a total of 58. The idle stacks are one Edgar Thomson, Edith, Neville Island, Niles, one Bellaire, Zanesville, Franklin, Steelton and Steubenville. Early this month the Franklin and Steelton furnaces at Columbus, Ohio, will be started, and it is possible that the Niles, Ohio, furnace will also be blown in this month to furnish metal for the Ohio works at Youngstown.

Pickans, Mather & Co., Cleveland, Ohio, blew in their Ella furnace at West Middlesex, Pa., Oct. 27, on Bessemer iron.

M. A. Hanna & Co., Cleveland, Ohio, plan to blow in their Fannie furnace at West Middlesex, Pa., about Nov. 15.

The Thomas Iron Company blew in Nov. 1 its No. 10 furnace at Hellertown, Pa. It will make basic pig iron with half anthracite and half coke for fuel. J. E. Thropp, Jr., is superintendent and W. A. Barrows, 3d, assistant superintendent.

In one day recently the furnace of the Pittsburgh Crucible Steel Company, Midland, Pa., made 653 tons of basic pig iron. The daily average for the month of October was 540 tons, the total for the month being 16,747 tons, both of which are record figures. It is rated only as a 450-ton furnace.

Consumption of steel in Russia has fallen during the war in spite of military requirements. Statistics of the Russian steel syndicate, the Prodarnets, show that orders in July were 80,131 net tons, as compared with 88,596 tons in July, 1914. For eight months to Aug. 1, 1915, the orders amounted to 1,261,620 tons, as compared with 1,344,600 tons to Aug. 1, 1915.

The Missouri Iron Company, St. Louis, Mo., has engaged Arthur G. McKee & Co., engineers, Cleveland, Ohio, to prepare plans for a blast-furnace plant to be erected in southeastern Missouri near ore bodies recently acquired.

The Iron and Metal Markets

THE TIDE RISING RAPIDLY

Pig Iron at 37,500,000 Tons a Year

Heavy Buying of Basic—Railroad Demand at High Pressure—All Prices Advancing

Never has the steel trade seen demand so overwhelming as at present and at the same time output expanding on such a scale, under steadily advancing prices. The tide has risen rapidly this week, with increasing signs of excitement.

In pig-iron history October goes down as the month in which the country's yield first reached 3,000,000 tons and the daily output crossed the 100,000-ton mark. When war-order tonnages of six figures are bandied about so commonly, it is hard to believe that the year opened with a daily pig-iron production of only 51,000 tons or half what it is now.

At 3,125,491 tons in 31 days, the October pig-iron output represents 100,822 tons a day, against 2,852,561 tons, or 95,085 tons a day, in September. On Nov. 1, with 276 furnaces going, the capacity in blast was 101,819 tons a day, against 97,535 tons a day for 268 furnaces on Oct. 1. Thus, including charcoal iron, our pig-iron output is now at the staggering rate of 37,500,000 tons a year, or 1,500,000 tons more than the rate of one month ago.

More furnaces are preparing to go in blast, but on the other hand some of the steel companies' furnaces that have been hard driven for months must soon go out for repairs.

An old-time buying movement in steel-making iron has been under way this week in the Central West. In the Pittsburgh and Valley districts 175,000 tons of basic and Bessemer iron has been taken, chiefly by four interests, and at Buffalo 70,000 tons of hot metal has been bought for delivery in the first half of 1916. Basic iron has advanced 50c. to \$15.50 at furnace and a further rise in both Bessemer and basic is indicated.

Buying of foundry iron is more general and contracts for the first half of 1916 are now freely made. The week has brought an average advance of 50c. in coke foundry irons and \$1 in charcoal iron, even though merchant furnaces increased their output last month by more than 2000 tons a day. Southern iron, following sales of nearly 150,000 tons by two interests in October, has gone to \$13 for No. 2, while sales for the first half of 1916 have been made at \$13.50 and higher.

An extraordinary situation exists regarding prices of finished steel. Orders have been sent in with the request that they be entered and the buyer notified of the price. In most lines it is a question of finding a mill that can make the delivery desired. On their part the mills are holding back demand for next year. Only the largest buyers seem able to get protection on their manufacturing costs for 1916, and some manufacturing consumers may find their output curtailed by lack of steel.

Chicago reports a record week's business, with 300,000 tons placed in finished materials.

In plates and shapes a few mills have open capacity late in the year and these have no difficulty in

getting \$2 a ton above the 1.50c., Pittsburgh, basis. Some Eastern structural mills have cut loose from the Pittsburgh basis and have secured 1.70c. to 1.75c. at mill.

Plate mills are filling up with car, locomotive and vessel business. The Standard Oil Company's latest order is for two 15,000-ton vessels. On the lakes twenty-six boats are now under contract, including seven bulk freighters, and the leading builder there has just ordered 12,500 tons additional of plates and shapes.

Under existing conditions cabled statements that the Allies will cut down their purchases of American steel because of high prices need not be taken seriously. Such buying has been, and is still, insistent. American steel makers have really been slow to believe what is now plain, that the dominant factor in the domestic situation is sheer tonnage of steel that is to be fired out of guns. In Great Britain THE IRON AGE's cable says that Government requirements for shell steel are beginning to occupy exclusive attention, new inquiry of this character there amounting to 2,000,000 tons.

Railroad buying is still at high pressure. The Pennsylvania has settled on 175,000 tons of rails, 44 per cent, or 77,000 tons, going to the Steel Corporation, 22 per cent each to the Pennsylvania and Cambria companies and the remainder, 21,000 tons, equally divided between the Bethlehem and Lackawanna companies. The Boston & Maine has placed 25,000 tons with the Lackawanna Steel Company.

In recent weeks the railroads have bought upward of 27,500 cars and as many more will shortly be closed, the latest inquiry being for 9000 for the Pennsylvania Railroad.

While steel output in October made a new record, along with pig iron, the mills fell farther behind in deliveries. Further price advances include \$1 a ton on bar iron, \$2 on merchant pipe, \$4 on boiler tubes, \$7 on boiler and structural rivets and from 10 to 20 per cent on nuts and bolts, with further advances looked for in wire, sheets and light rails.

Lake Superior iron-ore shipments in October were 7,146,873 tons, making the total to Nov. 1, 41,816,438 tons and indicating a season's lake movement between 46,000,000 and 47,000,000 tons.

A Comparison of Prices

Advances Over the Previous Week in Heavy Type Declines in Italics

	At date, one week, one month and one year previous	Nov. 3, Oct. 27, Sept. 1, Nov. 4,
Pig Iron, Per Gross Ton:	1915. 1915. 1914.	1915. 1915. 1914.
No. 2 X, Philadelphia...	\$16.75	\$16.25 \$15.50 \$14.50
No. 2, Valley furnace...	15.00	15.00 14.50 12.75
No. 2 Southern, Cin'ti...	15.90	15.40 13.90 12.90
No. 2, Birmingham, Ala...	13.00	12.50 11.00 10.00
No. 2, furnace, Chicago*	16.50	15.25 13.50 12.75
Basic, del'd, eastern Pa...	17.00	17.00 16.50 14.00
Basic, Valley furnace...	15.50	15.00 14.50 12.50
Bessemer, Pittsburgh...	16.95	16.95 16.45 14.55
Malleable Bess., Ch'go*	16.50	15.50 13.50 12.00
Gray forge, Pittsburgh...	15.20	14.70 14.45 13.40
L. S. charcoal, Chicago...	16.75	15.75 16.25 15.75

	Billets, etc. Per Gross Ton:	
Bess. billets, Pittsburgh...	25.00	25.00 23.50 19.50
O.-h. billets, Pittsburgh...	26.00	26.00 24.00 19.50
O.-h. sheet bars, P'gh...	27.00	27.00 24.50 20.00
Forging billets, base, P'gh	42.00	40.00 30.00 25.00
O.-h. billets, Phila...	32.00	32.00 32.00 21.40
Wire rods, Pittsburgh...	35.00	33.00 28.00 25.50

*The average switching charge for delivery to foundries in the Chicago district is 50c. per ton.

Sheets, Nails and Wire,		Nov. 3,	Oct. 27,	Sept. 1,	Nov. 4,
Per Lb. to Large Buyers:		1915.	1915.	1915.	1914.
Sheets, black, No. 28, P'gh.		Cents.	Cents.	Cents.	Cents.
Per Lb. to Large Buyers:		2.15	2.10	1.90	1.90
Sheets, black, No. 28, P'gh.		3.60	3.50	3.60	2.90
Galv. sheets, No. 28, P'gh.		1.85	1.85	1.65	1.60
Wire nails, Pittsburgh.		1.80	1.80	1.60	1.60
Cut nails, Pittsburgh.		1.70	1.70	1.50	1.40
Fence wire, base, P'gh.		2.70	2.70	2.50	2.60
Barb wire, galv., P'gh.					

Finished Iron and Steel,		Cents.	Cents.	Cents.	Cents.
Per Lb. to Large Buyers:					
Boss bars, heavy, at mill		1.25	1.25	1.25	1.25
iron bars, Philadelphia.		1.659	1.559	1.459	1.12
iron bars, Pittsburgh.		1.50	1.45	1.35	1.15
iron bars, Chicago.		1.45	1.45	1.25	0.97 1/2
Steel bars, Pittsburgh.		1.50	1.50	1.30	1.20
Steel bars, New York.		1.609	1.669	1.519	1.31
Tank plates, Pittsburgh.		1.709	1.669	1.519	1.26
Tank plates, New York.		1.50	1.50	1.30	1.10
Beams, etc., Pittsburgh.		1.669	1.669	1.519	1.26
Beams, etc., New York.		1.45	1.45	1.30	1.10
Skelp, grooved steel, P'gh.		1.50	1.50	1.35	1.15
Skelp, sheared steel, P'gh.		1.75	1.75	1.35	1.25
Steel hoods, Pittsburgh.					

Old Material, Per Gross Ton:		\$14.25	\$13.50	\$12.25	\$11.00
iron rails, Chicago.		17.50	17.50	18.00	13.00
iron rails, Philadelphia.		12.50	12.00	11.75	10.50
carwheels, Chicago.		13.50	13.50	13.50	9.50
carwheels, Philadelphia.		15.00	15.00	14.00	10.00
Heavy steel scrap, P'gh.		14.50	14.50	14.25	9.50
Heavy steel scrap, Phila.		12.50	11.75	11.75	8.50
Heavy steel scrap, Ch'go.		13.50	13.50	13.00	10.50
No. 1 cast, Pittsburgh.		14.00	14.00	14.00	11.00
No. 1 cast, Philadelphia.		11.75	10.50	10.00	8.75
No. 1 cast, Ch'go (net ton)					

Coke, Connellsville.

Per Net Ton at Oven:		\$2.25	\$2.50	\$1.50	\$1.60
Furnace coke, prompt.		2.35	2.35	1.75	1.75
Furnace coke, future.		2.75	2.75	2.00	2.00
Foundry coke, prompt.		2.60	2.60	2.25	2.15
Foundry coke, future.					

Metals.

Per Lb. to Large Buyers:		Cents.	Cents.	Cents.	Cents.
Lake copper, New York.		17.87 1/2	17.87 1/2	18.00	11.50
Electrolytic copper, N. Y.		17.87 1/2	17.87 1/2	17.75	11.25
Spelter, St. Louis.		14.75	14.00	16.00	4.90
Spelter, New York.		15.00	14.25	16.25	5.05
Lead, St. Louis.		4.80	4.62 1/2	4.75	3.37 1/2
Lead, New York.		4.90	4.75	4.90	3.50
Tin, New York.		35.87 1/2	33.50	33.50	31.80
Antimony, Asiatic, N. Y.		35.50	34.25	28.00	13.50
Tin plate, 100-lb. box, P'gh.		\$3.15	\$3.15	\$3.15	\$3.15

Finished Iron and Steel f. o. b. Pittsburgh

Freight rates from Pittsburgh in carloads, per 100 lb.: New York, 16.9c.; Philadelphia, 15.9c.; Boston, 18.9c.; Buffalo, 11.6c.; Cleveland, 10.5c.; Cincinnati, 15.8c.; Indianapolis, 17.9c.; Chicago, 18.9c.; St. Louis, 23.6c.; Kansas City, 43.6c.; Omaha, 43.6c.; St. Paul, 32.9c.; Denver, 68.6c.; New Orleans, 30c.; Birmingham, Ala., 45c.; Pacific coast, 73.9c. on plates, structural shapes and sheets and 65c. on wrought pipe and boiler tubes. The foregoing rates to the Pacific coast are by rail. The rate via New York and the Panama Canal is 56.9c.

Plates.—Tank plates, 1/4 in. thick, 6 1/4 in. up to 100 in. wide, 1.50c., base, net cash, 30 days. Following are stipulations prescribed by manufacturers:

Rectangular plates, tank steel or conforming to manufacturers' standard specifications for structural steel dated Feb. 6, 1903, or equivalent, 1/4 in. and over on thinnest edge, 100 in. wide and under, down to but not including 6 in. wide, are base.

Plates up to 72 in. wide, inclusive, ordered 10.2 lb. per sq. in., are considered 1/4-in. plates. Plates over 72 in. wide must be ordered 1/4 in. thick on edge or not less than 11 lb. per sq. ft., to take base price. Plates over 72 in. wide ordered less than 11 lb. per sq. ft. down to the weight of 3-16 in. take the prices of 3-16 in.

Allowable overweight, whether plates are ordered to gage or weight to be governed by the standard specifications of the Association of American Steel Manufacturers.

Extras	Cents per lb.
Gages under 1/4 in. to and including 3-16 in.	.10
Gages under 3-16 in. to and including No. 8.	.15
Gages under No. 8 to and including No. 9.	.25
Gages under No. 9 to and including No. 10.	.30
Gages under No. 10 to and including No. 12.	.40
Sketches (including straight taper plates), 3 ft. and over.	.10
Complete circles, 3 ft. in diameter and over.	.20
Boiler and flange steel.	.10
A. B. M. A. and ordinary firebox steel.	.20
Still bottom steel.	.30
Marine steel.	.40
Locomotive firebox steel.	.50
Widths over 100 in. up to 110 in., inclusive.	.05
Widths over 110 in. up to 115 in., inclusive.	.10
Widths over 115 in. up to 120 in., inclusive.	.15
Widths over 120 in. up to 125 in., inclusive.	.25
Widths over 125 in. up to 130 in., inclusive.	.50
Widths over 130 in.	.00
Cutting to lengths under 3 ft. to 2 ft., inclusive.	.25
Cutting to lengths under 2 ft. to 1 ft., inclusive.	.50
Cutting to lengths under 1 ft.	.55
No charge for cutting rectangular plates to lengths 3 ft. and over.	

Wire Products.—Prices to jobbers: Fence wire, Nos. 0 to 9, per 100 lb., terms sixty days or 2 per cent discount in ten days, carload lots, annealed, \$1.70; galvanized, \$2.40. Galvanized barb wire and staples, \$2.70; painted, \$2. Wire nails, \$1.85. Galvanized nails, 1 in. and longer, \$1.75 advance over base price; shorter than 1 in., \$2.25 advance over base price. Woven wire fencing, 68 1/2 per cent off list for carloads, 67 1/2 off for 1000-rod lots, 66 1/2 off for less than 1000-rod lots.

The following table gives the price per 100 lb. to retail merchants on fence wire in less than carloads, with the extras added to the base price:

Plain Wire, per 100 lb.							
Nos.	0 to 9	10	11	12 & 12 1/2	13	14	15
Annealed	\$1.75	\$1.80	\$1.85	\$1.90	\$2.00	\$2.10	\$2.20
Galvanized	2.65	2.70	2.75	2.80	3.00	3.30	3.40

Wire Rods.—Bessemer, open-hearth and chain rods, \$35.

Structural Material.—I-beams, 3 to 15 in.; channels, 3 to 15 in.; angles, 3 to 6 in. on one or both legs, 1/4 in. thick and over, and zees 3 in. and over, 1.50c.

Wrought Pipe.—The following are the jobbers' carload discounts on the Pittsburgh basing card in effect from Aug. 16, 1915, on steel and iron galvanized pipe, and from Nov. 1, 1915, on steel and iron black pipe, all full weight:

Steel		Iron	
Inches	Black	Galv.	Black
1/8, 1/4 and 3/8	.71	46 1/2	1/8 and 1/4
1/2	.75	59 1/2	3/8
3/4 to 3	.78	63 1/2	1/2
			3/4 to 2 1/2
			70
			52

Lap Weld		Reamed and Drifted	
1 to 3, butt	.76	61 1/2	1 to 1 1/2, butt
2, lap	.73	58 1/2	2, butt
2 1/2 to 6, lap	.75	60 1/2	1 1/4, lap
7 to 12	.75	58 1/2	2 1/2, lap
13 and 14	.61 1/2	61 1/2	2 1/2 to 4, lap
15	.59	63 1/2	7 to 12

Lap Weld, extra strong, plain ends		Butt Weld, extra strong, plain ends	
1/8, 1/4 and 3/8	.66	49 1/2	1/8
1/2	.71	58 1/2	1/2
3/4 to 1 1/2	.75	62 1/2	2 1/2
2 to 3	.76	63 1/2	2 and 2 1/2

Lap Weld, extra strong, plain ends		Butt Weld, double extra strong, plain ends	
2	.62	49 1/2	2
2 1/2 to 4	.64	51 1/2	2 1/2 to 4
4 1/2 to 6	.63	50 1/2	4 1/2 to 6
7 to 8	.57	40 1/2	7 to 8

To the large jobbing trade an additional 5 per cent is allowed over the above discounts.

The above discounts are subject to the usual variation in weight of 5 per cent. Prices for less than carloads are two (2) points lower basing (higher price) than the above discounts on black and three (3) points on galvanized.

Boiler Tubes.—Discounts on less than carloads, f.o.b. Pittsburgh, freight to destination added, on lap welded steel tubes and standard charcoal iron tubes, effective from Oct. 29, 1915, are as follows:

Lap Welded Steel		Standard Charcoal Iron	
1 1/2 in.	48	1 1/2 in.	43 to 44
1 3/4 and 2 in.	60	1 3/4 and 2 in.	47 to 48
2 1/4 in.	57	2 1/4 in.	44 to 45
2 1/2 and 2 3/4 in.	63	2 1/2 and 2 3/4 in.	51 to 52
3 and 3 1/4 in.	68	3 and 3 1/4 in.	53 to 56
3 1/2 to 4 1/2 in.	69	3 1/2 to 4 1/2 in.	57 to 58
5 and 6 in.	62	5 and 6 in.	51 to 52
7 to 13 in.	59		

Locomotive and steamship special charcoal grades bring higher prices.

1 3/4 in., over 18 ft., 10 per cent net extra.

2 in. and larger, over 22 ft., 10 per cent net extra.

Sheets.—Makers' prices for mill shipment on sheets, of U. S. Standard gage, in carload and larger lots, on which jobbers charge the usual advance for small lots from store, are as follows, f.o.b. Pittsburgh, terms thirty days net, or 2 per cent cash discount in ten days from date of invoice:

Blue Annealed Sheets

	Cents per lb.
Nos. 3 to 8	1.55 to 1.65
Nos. 9 to 10	1.60 to 1.70
Nos. 11 and 12	1.65 to 1.75
Nos. 13 and 14	1.70 to 1.80
Nos. 15 and 16	1.80 to 1.90

Box Annealed Sheets, Cold Rolled

	Cents per lb.
Nos. 10 and 11	1.80 to 1.85
No. 12	1.80 to 1.85
Nos. 13 and 14	1.85 to 1.90
Nos. 15 and 16	1.90 to 1.95
Nos. 17 to 21	1.95 to 2.00
Nos. 22 and 24	2.00 to 2.05
Nos. 25 and 26	2.05 to 2.10
No. 27	2.10 to 2.15
No. 28	2.15 to 2.20
No. 29	2.20 to 2.25
No. 30	2.30 to 2.35

Galvanized Sheets of Black Sheet Gage

	Cents per lb.
Nos. 10 and 11	2.60 to 2.70
No. 12	2.70 to 2.80
Nos. 13 and 14	2.70 to 2.80
Nos. 15 and 16	2.80 to 2.90
Nos. 17 to 21	2.95 to 3.05
Nos. 22 and 24	3.15 to 3.25
Nos. 25 and 26	3.30 to 3.40
No. 27	3.45 to 3.55
No. 28	3.60 to 3.70
No. 29	3.75 to 3.85

Pittsburgh

PITTSBURGH, PA., Nov. 2, 1915.

Successive advances in prices on iron and steel products do not seem to curtail demand in the least, but, on the contrary, increase it. Conditions in the trade have reached the point that customers are sending in orders with letters asking that the mills will notify the customers at their convenience of the prices at which the orders are entered. On most lines now it is not a question of price, but where to find a mill that will take the order and make deliveries wanted. On plates, shapes and bars the market is 1.50c., strong, and if the mills were so disposed they could easily fill up their entire capacity for the next four or five months. The placing of heavy orders for steel rails and steel cars by the railroads is aggravating the situation. A veritable famine in steel is in sight, and prices may make new records. During the week merchant pipe has been advanced \$2 per ton and boiler tubes \$4, with advances expected in wire, sheets, light rails and other products. October made a record in output of steel, and yet the mills are getting worse off in deliveries. It is no uncommon thing to hear of a mill being back three to four months, or having a certain department filled up from four to six months. Almost unheard of prices are being paid on some products where the deliveries can be obtained.

Pig Iron.—W. P. Snyder & Co. report the average price of Bessemer iron for October to have been \$16, and of basic, \$15.0147, both at Valley furnace. On Bessemer this is an increase over September of 9.4c., and on basic an increase of 1.47c. Heavy sales have been made of Bessemer and basic pig iron and others are under negotiation. The Youngstown Sheet & Tube Company has bought from 20,000 to 25,000 tons of Bessemer and 55,000 tons or more of basic. The Bessemer was bought at \$16 at furnace, part coming from Shenango and the remainder from Mahoning Valley makers. The basic was bought at \$15.50, Valley furnace. The Jones & Laughlin Steel Company recently bought 25,000 tons from a local interest and has just bought 10,000 tons additional, or 35,000 tons in all, paying \$15, Valley furnace. The Republic Iron & Steel Company is reported to have bought about 15,000 tons of Bessemer at \$16, Valley furnace. Sharon steel casting interests have bought 25,000 to 30,000 tons of basic at about \$15.25, at furnace. Other sales are noted of 6000 tons and 2500 tons of basic at \$15.50, Valley furnace. Other consumers in the Pittsburgh and Wheeling districts have bought probably 20,000 tons of basic. The total sales of Bessemer and basic since

Saturday were about 175,000 tons. These heavy purchases have about cleaned up the available supply of Bessemer and basic and higher prices are indicated. When the Jones & Laughlin Steel Company took over the Kittanning blast furnace it had to arrange for taking care of contracts for about 15,000 tons of basic taken by the furnace company, and the fact that this furnace will not be a seller of basic iron strengthens the market. Prices on foundry and malleable Bessemer iron are higher, and the market is very strong. We note a sale of 500 tons of Bessemer iron for shipment to Italy at \$16, and another sale of 100 tons at \$16.25, Valley furnace. We quote standard Bessemer iron, \$16 to \$16.10; basic, \$15.50; malleable Bessemer, \$15 to \$15.25; gray forge, \$14 to \$14.25, and No. 2 foundry at \$15, all at Valley furnace, the freight rate for delivery in the Cleveland or Pittsburgh district being 95c. per ton.

Billets and Sheet Bars.—All kinds of prices are being heard of as having been paid for both Bessemer and open-hearth billets, and the market is very difficult to quote. Most of the steel mills have large orders for forging billets on which there is a heavy profit, and they are keeping away from orders for ordinary billets as much as possible. Within a week orders for 50,000 to 60,000 tons of forging billets have been placed, and as high as \$56 per ton has been paid for high-carbon billets. Small steel-casting plants are getting in the game and are selling open-hearth billets of both ordinary and high carbons. They turn out the ingots and then have them bloomed by open-hearth steel concerns that have excess capacity. It is said that \$28 has been paid for open-hearth billets of ordinary carbons. Prices quoted for two to three months delivery ahead, but over which premiums would be paid for prompt delivery, are as follows: Bessemer billets, \$25; open-hearth billets, \$26; Bessemer sheet bars, \$26, and open-hearth sheet bars, \$27, maker's mill, Youngstown or Pittsburgh, prices of steel at the two points named being about the same. Higher prices have been paid for open-hearth billets and sheet bars for prompt delivery. We quote forging billets at \$42 to \$45 for sizes up to but not including 10 x 10 in. and for carbons up to 0.25, the regular extra being charged for larger sizes and higher carbons. Forging billets running above 0.25 and up to 0.60 carbon take \$1 per ton extra. Axle billets are held at \$31 to \$32.

Ferroalloys.—The situation in ferromanganese is easier and English 80 per cent ferro is still being offered at \$90, seaboard, or less. This has resulted in a reduction in prices on domestic, which is quoted as low as \$90. Sales of 200 to 300 tons of English 80 per cent ferromanganese are reported at about \$90, seaboard. Makers of 50 per cent ferrosilicon have finally fixed prices for all of 1916 delivery as follows: Up to 100 tons, \$85; up to 600 tons, \$84, and over 600 tons, \$83, delivered in the Pittsburgh district. These prices show an advance of \$12 a ton over prices ruling for this year. Prices on Bessemer ferrosilicon are very firm as follows: 9 per cent, \$22; 10 per cent, \$23; 11 per cent, \$24; 12 per cent, \$25; 13 per cent, \$26.50; 14 per cent, \$28.50; 15 per cent, \$30.50, and 16 per cent, \$33. These prices are for delivery up to April 1, 1916, and for delivery in second quarter of next year \$1 per ton advance is charged. We note a sale of 500 tons of 11 per cent ferrosilicon at \$24 at furnace for first quarter. These prices are f.o.b. furnace, Ashland, Ky., Jackson, Ohio, or New Straitsville, Ohio, each of these points having a freight rate of \$2 per gross ton to Pittsburgh. We quote ferrotitanium at 8c. per pound in carloads, 10c. in 2000-lb. lots and over, and 12c. in smaller lots; ferrovanadium, \$2.25 to \$2.50 per pound of contained vanadium.

Steel Rails.—The Pennsylvania Railroad has placed 175,000 tons of rails for 1916 delivery. The approximate division of the order is as follows: Carnegie and Illinois steel companies, 77,000 tons; Cambria, 38,500 tons; Pennsylvania, 38,500 tons; Lackawanna, 10,500 tons, and Bethlehem, 10,500 tons. It is said that other leading roads will place large orders for rails in the near future. The demand for light rails continues active, the Carnegie Steel Company having received new orders and specifications in the past week for

close to 4500 tons. We quote standard section rails of Bessemer stock at 1.25c., and of open-hearth stock, 1.34c., f.o.b., Pittsburgh. We quote light rails as follows: 25 to 45-lb. sections, 1.34c.; 16 and 20 lb., 1.39c.; 12 and 14 lb., 1.44c.; 8 and 10 lb., 1.49c., in carload or larger lots, 5c. per 100 lb. advance being charged for less than carload lots.

Structural Material.—New inquiry is very heavy and several fairly large contracts have been placed. The Jones & Laughlin Steel Company has taken 400 tons for an addition to a spinning mill of George E. Kunhardt, Lawrence, Mass. The Brier Hill Steel Company has placed a contract with the Lackawanna Bridge Company, Buffalo, N. Y., for an addition to its open-hearth steel building at Youngstown, Ohio, about 2000 tons, to take care of two more open-hearth furnaces. The Riter-Conley Mfg. Company is furnishing 1500 tons for additions to steel buildings for the Trumbull Steel Company, Warren, Ohio. Last Saturday bids were opened on about 850 tons for an extension to the Duquesne freight station in this city, but the contract has not yet been placed. Prices are very firm. We quote beams and channels up to 15 in. at 1.50c., f.o.b. Pittsburgh, for delivery through first quarter of 1916.

Plates.—Some heavy orders for cars have come out the past week, and others are in sight. The New York Central has placed 6500 cars of the steel hopper type with the Standard Steel Car Company, 2000 box cars with Haskell & Barker, 1000 automobile cars with the Pullman Company and 1500 of the same type with the American Car & Foundry Company. The Pennsylvania Railroad has sent out inquiries for 9000 cars of various types, of which 6000 are for the Lines East and 3000 for the Lines West. Other leading roads are making up estimates of cars needed, and their inquiries are likely to come out soon. Local plate mills are operating to 100 per cent of capacity, and have their output sold up largely through first quarter. It is said that all plate mills are now quoting 1.50c. minimum, and some in the trade believe that plates will soon reach 1.60c. We quote $\frac{1}{4}$ -in. and heavier plates at 1.50c. minimum, f.o.b. Pittsburgh.

Sheets.—The American Sheet & Tin Plate Company, Pittsburgh, has taken an order for 6900 tons of 11 and 13 gage blue annealed sheets for shipment to France. Orders for hot sheet and tin mill products received in October by this company were the heaviest in any one month in its history. In the past week the new demand for galvanized sheets has come up very fast and is now quite heavy. For blue annealed and Bessemer black the demand is also heavy, and if steel could be had promptly most of the sheet mills would be able to run to 100 per cent capacity. The American Sheet & Tin Plate Company has advanced its price on galvanized and is now quoting 3.70c. for No. 28 gage for remainder of the year and 3.80c. for first quarter. Other mills are also quoting higher prices. It is stated that quite a few contracts for sheets for first quarter have been placed on the basis of 1.80c. for No. 10 blue annealed, 2.25c. for No. 28 Bessemer black and 3.65c. to 3.75c. for No. 28 galvanized. For remainder of the year delivery we quote Nos. 9 and 10 blue annealed at 1.70c. to 1.80c.; No. 28 galvanized, 3.60c. to 3.70c.; No. 28 Bessemer black, 2.10c. to 2.20c.; No. 30 black plate, tin-mill sizes, H. R. & A., 1.95c.; No. 28, 1.90c.; Nos. 27, 26 and 25, 1.85c.; Nos. 22 and 24, 1.80c.; Nos. 17 to 21, 1.75c.; Nos. 15 and 16, 1.70c. The above prices are for carload lots, f.o.b. at maker's mill.

Railroad Spikes.—Local makers have advanced prices 5c. per 100 lb. for delivery in first quarter. The Baltimore & Ohio Railroad is in the market for 20,000 to 30,000 kegs. Spike makers say they are well filled for several months. We quote standard railroad spikes at \$1.70 to \$1.75 per 100 lb. for delivery over remainder of this year and first quarter of 1916. We quote small railroad and boat spikes at \$1.80 to \$1.85 for delivery into first quarter and \$1.90 for second quarter per 100 lb., f.o.b. Pittsburgh.

Tin Plate.—A good many contracts for tin plate expire Nov. 15 and Dec. 1, and makers expect that specifications against these contracts will be very heavy in

November, and will give the mills about enough work to carry them running full up to Feb. 1. No price has yet been named on tin plate for 1916 delivery, but the general belief is that it will be about \$3.40 per base box. There is still some export demand and shipments are being made of fairly large lots. The domestic demand for tin plate is quiet, but in some cases large consumers have increased the amount of tin plate called for in their contracts. Some of the salmon packers in the West have bought fairly large lots for delivery through the first quarter of 1916 at \$3.25 per base box. For prompt delivery we quote 14 x 20 coke plates at \$3.15 to \$3.25 per base box.

Cold-Rolled Strip Steel.—New demand is active and makers have their output pretty well sold up into first quarter. Specifications are heavy. All the cold-rolled strip steel mills are running to full capacity, and prices are very firm, premiums being paid in some cases for prompt delivery. We quote hard-rolled steel, $1\frac{1}{2}$ in. and wider, under 0.20 carbon, sheared or natural mill edge, per 100 lb., \$3.25 delivered. Extras, which are standard among all mills, are as follows:

Thickness, in.	Extras for thickness	Extras for soft or intermediate tempers	Extras for straightening and cutting to lengths not less than 24 in.
0.100 and heavier	Base	\$0.25	\$0.10
0.099 to 0.050	\$0.05	0.25	0.15
0.049 to 0.035	0.20	0.25	0.15
0.034 to 0.031	0.35	0.40	0.25
0.030 to 0.025	0.45	0.40	0.40
0.024 to 0.020	0.55	0.40	0.50
0.019 to 0.017	0.85	0.50	1.10
0.016 to 0.015	1.25	0.50	1.10
0.014 to 0.013	1.95	0.50	1.25
0.012	2.30	0.50	coils only
0.011	2.65	0.50	coils only
0.010	3.00	0.50	coils only

Skelp.—With the heavy demand for merchant pipe, more activity in the skelp trade is looked for in the near future. Prices are very strong. We quote: Grooved steel skelp, 1.50c. to 1.55c.; sheared steel skelp, 1.55c. to 1.60c.; grooved iron skelp, 1.90c. to 1.95c., and sheared iron skelp, 2c. to 2.05c., all delivered to consumers' mills in the Pittsburgh district.

Wire Rods.—It is stated that wire rods are scarcer and harder to get than any other steel product. Several buyers of wire rods were here the past week and offered as high as \$35, but without being able to place orders at any of the local mills, which have their excess output sold up for several months. We now quote Bessemer, open-hearth and chain rods at \$35. maker's mill.

Wire Products.—The activity in the wire trade shows no signs of letting up, and almost every day local makers of plain and barb wire are importuned to accept export orders which they cannot handle. It is stated that bona fide inquiries are in the market at present for close to 250,000 tons of painted and galvanized barb wire, but very little of this business can be handled by local mills. It is believed that wire products will be advanced again this month, and \$2 nails are predicted by Jan. 1, if not before. Mills report specifications against contracts for wire and wire nails as very active. We quote wire nails, \$1.85; galvanized nails 1 in. and longer taking an advance over this price of \$1.75, and shorter than 1 in., \$2.25; plain annealed wire, \$1.70; galvanized barb wire and fence staples, \$2.70; painted barb wire, \$2; polished fence staples, \$2, all f.o.b. Pittsburgh, with freight added to point of delivery, terms sixty days net, less 2 per cent off for cash in ten days. Prices on woven wire fencing are 68 $\frac{1}{2}$ per cent off list for carload lots, 67 $\frac{1}{2}$ per cent for 1000-rod lots, and 66 $\frac{1}{2}$ per cent for small lots, f.o.b. Pittsburgh.

Rivets.—The new demand continues heavy and export inquiry is very active. Shipments of large quantities of rivets have been made recently to England, France, South America and Argentine Republic. Local makers state they are filled up for two to three months and prices are likely to be higher. We quote button-head structural rivets at \$2.25 and conehead boiler rivets at \$2.35 in carload lots, per 100 lb., f.o.b. Pittsburgh, smaller lots bringing about 10c. advance, and for delivery this year only.

Hoops and Bands.—Mills report specifications against contracts for hoops and bands very heavy, and shipments in October made a high record. Most large consumers are covered over the remainder of this year and first quarter of next year at somewhat lower prices than are ruling now and specifications are heavy. We quote steel hoops at 1.75c. and steel bands at 1.50c., f.o.b. Pittsburgh, with extras on the latter as per the steel bar card.

Iron and Steel Bars.—It is said that some large contracts for steel bars have been placed lately at the full price of 1.50c. for delivery through first quarter. Leading steel bar makers are pretty well sold up through first quarter and the market is very firm. Heavy export inquiry is coming in for steel rounds, but on this class of work the local mills are filled up for several months, and not able to quote on most of the inquiries. We quote steel bars at 1.50c. for delivery through first quarter; refined iron bars, 1.50c., and railroad test iron bars, 1.60c., in carload lots, f.o.b. Pittsburgh, the usual advances being charged for small lots.

Shafting.—Local makers say they have their output sold up for three to four months or longer, and are being importuned by some consumers to take orders for prompt delivery at premiums over regular prices. Specifications from the automobile and screw stock machine trades are very heavy. We quote cold-rolled shafting at 58 per cent off in carloads and 53 per cent in less than carloads, f.o.b. Pittsburgh.

Merchant Steel.—Output and shipments of merchant steel in October made a new record and yet the mills have not caught up on back orders to any extent. Specifications are heavy and prices are very firm. On small lots we quote: Iron finished tire, $\frac{1}{2} \times 1\frac{1}{2}$ in. and larger, 1.70c. base; under $\frac{1}{2} \times 1\frac{1}{2}$ in., 1.85c.; planished tire, 1.90c.; channel tire, $\frac{3}{4}$ to $\frac{7}{8}$ and 1 in., 2.20c. to 2.30c.; 1 x $\frac{1}{2}$ in. and larger, 2.30c.; toe calk, 2.30c. to 2.40c., base; flat sleigh shoe, 2.05c.; concave and convex, 2.10c.; cutter shoe, tapered or bent, 2.60c. to 2.70c.; spring steel, 2.30c. to 2.40c.; machinery steel, smooth finish, 2.10c.

Merchant Pipe.—Effective Monday, Nov. 1, discounts on black iron and steel pipe were lowered one point, equal to an advance of \$2 per ton, and line pipe was also advanced \$2 per ton on all sizes. Makers report the new demand for merchant pipe as better than for some time, and pipe mills are now operating close to 75 per cent of capacity. The demand for oil well supplies is also heavier. The new discounts on black iron and steel pipe are given on a previous page.

Boiler Tubes.—Effective Saturday, Oct. 30, discounts on steel and charcoal iron tubes were lowered two points, equal to an advance of \$4 per ton. Mills report the demand for locomotive and merchant tubes heavier than for some time. The new discounts are given on a previous page.

Nuts and Bolts.—On account of the steadily increasing prices and greater scarcity of raw materials, makers of nuts and bolts have again advanced prices on nearly all sizes. The new demand is unprecedently active, and heavy export shipments are being made. Discounts now in effect are as follows: Common carriage bolts, $\frac{3}{8} \times 6$ in., and shorter and smaller, rolled thread, 75 & 10; cut thread, 75 & 5; larger or longer, 70. Machine bolts with h. p. nuts, $\frac{3}{8} \times 4$ in., and shorter and smaller, rolled thread, 75, 10 & 5; cut thread, 75 & 10; larger or longer, 70 & 5. Machine bolts with c. p. c. t. and r. nuts, $\frac{3}{8} \times 4$ in., and shorter and smaller, 70, 10 & 10; larger or longer, 65 & 10. Forged set screws and tap bolts, 45 & 5. Rough stud bolts, 65 & 10. Lag screws (cone or gimlet point), 80. Square nuts, h. p., tapped or blank, \$5.40 off list; hexagon, \$5.70 off; c.p.c. t. and r. nuts, tapped or blank, square, \$4.80 off; hexagon, $\frac{3}{8}$ in. and larger, \$6.25 off; plain c. p. square nuts, \$4.70 off; plain hexagon nuts, \$5 off; semi-finished nuts, 80, 10 & 5. Rivets, smaller than $\frac{1}{2}$ in. in diameter, 75, 10 & 10. All the foregoing prices are f.o.b. Pittsburgh, subject to an actual freight allowance not to exceed 20c. per 100 lb. on shipments of 300 lb. or more.

Coke.—Last week's flurry in prompt furnace coke caused by heavy purchases of the Republic Iron & Steel Company has pretty well subsided and prices are easier. Several very large inquiries for contract furnace coke are in the market, but they are slow in being closed. A Cleveland interest is inquiring for 20,000 to 25,000 tons per month, the Wisconsin Steel Company, Chicago, for about 12,000 tons per month and the Cambria Steel Company for the coke for one blast furnace, about 15,000 tons per month. It is expected that some of these contracts will be closed soon. We quote standard makes of prompt blast furnace coke at \$2.25 to \$2.50; on contracts for first half of next year, \$2.35 to \$2.50 and for all of next year \$2.25 per net ton at oven. Prices on 72-hr. foundry coke are \$2.75 for prompt shipment and \$2.60 to \$2.75 on contracts for first half of 1916 for the very best grades. The output of coke in the Upper and Lower Connellsville region last week was about 425,000 tons, the high record in one week for several years.

Old Material.—Consumers are taking more interest in the market, and all kinds of steel scrap for open-hearth purposes are very strong. A local interest has bought 5000 to 6000 tons of selected heavy steel scrap at \$15 delivered to its works, but dealers have paid each other as high as \$15.50. There is still a heavy demand for low phosphorus melting stock. The belief is that, owing to the higher prices for basic iron, most grades of steel scrap will soon move upward. Dealers quote for delivery in the Pittsburgh and nearby districts that take the same rates of freight, as follows, per gross ton:

Heavy steel melting scrap, Steubenville, Follansbee, Brackenridge, Sharon, Monessen, Midland and Pittsburgh delivery	\$15.00 to \$15.50
Compressed side and end sheet scrap	13.00 to 13.25
No. 1 foundry cast	13.50 to 13.75
Bundled sheet scrap, f.o.b. consumers' mills, Pittsburgh district	12.25 to 12.50
Reshelling rails, Newark and Cambridge, Ohio, Cumberland, Md., and Franklin, Pa.	14.75 to 15.00
No. 1 railroad malleable stock	13.25 to 13.50
Railroad grate bars	9.75 to 10.00
Low phosphorus melting stock	19.50 to 20.00
Iron car axles	20.50 to 21.00
Steel car axles	19.00 to 19.50
Locomotive axles, steel	19.75 to 20.25
No. 1 busheling scrap	12.50 to 12.75
Machine shop turnings	8.25 to 8.50
Old carwheels	13.00
Cast-iron borings	9.50 to 9.75
*Sheet bar crop ends	14.00 to 14.50
Old iron rails	14.00 to 14.50
No. 1 railroad wrought scrap	14.25 to 14.50
Heavy steel axle turnings	10.75 to 11.00
Heavy breakable cast scrap	12.50 to 12.75

*Shipping point.

Philadelphia

PHILADELPHIA, PA., Nov. 2, 1915.

A most important and welcomed development is the waking up of pig-iron demand. The activity of the past few days has been the best in several months. Buying, while mostly confined to moderate-sized lots, is widespread and has not been halted by higher prices. New England consumers have been especially active, have called for good-sized lots and in many cases have wanted prompt shipments. Low phosphorus iron continues to climb. Only a few comparatively small sales of basic have been made, but these were at full prices. The pipe works are understood to be quietly buying iron. Increased railroad buying is adding to the pressure on the steel mills, and in view of the already overburdened condition of the latter there is much conjecture as to how the demands of the roads will be satisfied, particularly if they continue to develop in volume. There is a decided increase in inquiry for small lots of structural shapes which will serve to fill up the smaller mills. The strength of the structural market is indicated by the action of some eastern Pennsylvania mills in ignoring the Pittsburgh base and fixing prices at their mills. The range from

1.70c. to 1.75c. Makers of billets whose finishing capacity exceeds their maximum billet production are out of the market on semi-finished steel. Plates are in heavy demand for cars, locomotives and ships. Some makers of steel bars will not quote. Prices of all steel products vary, depending on the urgency of consumers' needs and the ability of mills to ship. Coke is strong with some good business pending. The tone of the scrap market is improved. Spot ferromanganese is a trifle easier, due to larger arrivals.

Pig Iron.—Activity in foundry iron has shown a pronounced betterment in the past few days, and the general opinion of the trade is that demand will increase. Purchases have been more numerous than for many weeks. Prices have responded to the activity, and the minimum obtainable is about 50c. higher than it was a week ago. Producers who were asking \$15.50, furnace, or \$16.29, Philadelphia, for last quarter shipments of eastern Pennsylvania No. 2X are now quoting \$16.79, delivered. Others ask \$16.25, furnace, or \$17.09, delivered here, while Virginia No. 2X has been advanced to \$14.50, furnace, or \$17.25, Philadelphia, and sales have been made at the higher price, all of which indicates \$16.75 to \$17.25 as the range within which No. 2X iron can be obtained. Some indication of the increased activity is afforded by the experience of one office which booked orders for 2500 tons of Virginia iron, and for about the same amount of Northern iron within the week. The demand is widespread in the form of orders of moderate size, mostly 200 to 500 tons, although New England consumers are taking larger quantities. The shops in that section appear to be busier than elsewhere, and certain buyers have not only bought generously, but have specified 1000 tons or more for immediate delivery. Others have bought for first quarter. More business has been done into the second quarter, but the aggregate is not great, some of the furnaces being unwilling to consider that delivery. Speculators are showing their faith in the future by endeavoring to buy pig-iron warrants. A Virginia interest disposed of 36,000 tons in October, 25,000 tons of which went in the last ten days of the month. It now has all the business it can handle for the remainder of the year, and its representatives have been notified to proceed slowly. For No. 1X, \$14.75, furnace, is quoted, delivery this year or first quarter; for No. 2X, \$14.50, and for No. 2 plain, \$14.25, the freight rate being \$2.75. A Virginia furnace having only No. 2 plain to offer is quoting \$13.50, furnace, for this year's delivery, \$14.25 for first quarter, and \$14.50 for second quarter. Inquiry from the pipe makers has been more active, and they are quietly taking iron. A Lynchburg, Va., interest has an inquiry out for 9000 tons. Charcoal iron has been more active, also, one consumer taking 1400 tons, while a few others took a total of 1900 tons. Last week the makers advanced their quotations 75c. a ton on last quarter delivery and 25c. on first quarter, making the approximate range \$16.75 to \$18.25, Buffalo, but yesterday they announced a further advance of 50c. per ton on Nos. 2 and 3, and furthermore notified their agents that orders were subject to confirmation. Standard low phosphorus is up to \$29 to \$30, delivered, and the makers of Lebanon low phosphorus are quoting \$25 to \$26, furnace, and are not eager to sell. A few thousand tons of first quarter basic was taken at the full price. Second quarter deliveries range from \$17.50 to \$17.75. Quotations for standard brands, delivered in buyers' yards, shipment this year, range about as follows:

Eastern Penna., No. 2 X foundry	\$16.75 to \$17.25
Eastern Penna., No. 2 plain	16.50 to 17.00
Virginia, No. 2 X foundry	17.25
Virginia, No. 2 plain	16.25 to 17.00
Gray forge	15.50 to 15.75
Basic	17.00 to 17.50
Standard low phosphorus	29.00 to 30.00

Iron Ore.—Two cargoes of Spanish low phosphorus ore and about 50,000 tons of Cuban low phosphorus ore, altogether about 70,000 tons, have been taken by one eastern Pennsylvania buyer for 1916 delivery on private terms. In the week ended Oct. 30 arrivals from Cuba aggregated 13,255 tons.

Ferroalloys.—There has been a little buying of 80 per cent ferromanganese for November shipment at \$100, seaboard. There is less tendency to exact premiums for prompt deliveries, and \$100 has been shaded to the extent of waiving a freight rate of approximately \$1. Arrivals at this port last week aggregated 734 tons. The quotations for 50 per cent ferrosilicon continue on the new basis of \$85 to \$87, Pittsburgh, according to quantity.

Bars.—Steel bars are extremely scarce. Some of the mills are taking no orders except from regular customers and even then the quantities supplied are smaller than desired by the buyers. Under such circumstances prices are irregular, and it would be difficult to find 1.659c., Philadelphia, based on 1.50c., Pittsburgh. Consumers who have contracts are taking their full quotas, and this with business from other directions has filled up the mills. The Baltimore & Ohio Railroad has taken 3000 tons and wanted more. On new inquiries for ordinary iron bars quotations range from 1.709c. to 1.759c., Philadelphia, for carload lots, but regular customers are supplied at 1.659c. The demand is good and growing stronger.

Plates.—Railroad activity in the purchase of locomotives and cars, as well as demand from the shipyards, is adding to the burden of the mills. Some of the locomotive, car and ship builders have contracts which expire at the end of the year, and they are specifying heavily. The Pennsylvania Railroad has placed 75 locomotives with the Baldwin Locomotive Works; the Atchison, Topeka & Santa Fe, 30 with Baldwin; the Baltimore & Ohio, 15 with Baldwin and 15 with the American Locomotive Company—all of the Mallet type. The Philadelphia & Reading has placed 10 with Baldwin, in addition to the 20 ordered a month ago. The Maryland Steel Company has received an order for two boats from the Standard Oil Company. A leading plate mill, which is crowded and which made some contracts at 1.759c., Philadelphia, a few days ago, has withdrawn that price and now is asking 1.859c., Philadelphia, on first quarter contracts. On miscellaneous business, delivery at the convenience of the mill, the company in question is quoting 1.809c., Philadelphia. In other directions, 1.759c., Philadelphia, is the open quotation and probably could be shaded. The Chicago Iron & Bridge Works, Chicago, has a contract for building 67 steel tanks at the plant of the Curtis Bay Distillery, Curtis Bay, Md.

Structural Material.—The steel work for the union station at Macon, Ga., has been awarded to the Virginia Bridge & Iron Company, Roanoke, Va. About 2000 tons will be required. The general contract went to J. Henry Miller, Baltimore. The Pennsylvania Railroad took bids yesterday on approximately 300 tons of small bridge work. There are now before the market a great many small jobs ranging from 100 to 300 tons, which will make the medium-sized shops busy—work they have needed. Plans are out for the first of several shop buildings to be erected for the Lehigh & Wilkes-Barre Coal Company, Ashley, Pa. The first installment calls for nearly 200 tons of shapes. The strength of the market is indicated by the fact that eastern Pennsylvania steel companies are quoting at their mill and ignoring the Pittsburgh base. One such quotation is 1.75c., Phoenixville, and another, 1.70c., Pottsville, the prices being on miscellaneous orders. One of these mills has taken no business into 1916. Larger companies quote 1.659c., Philadelphia, based on 1.50c., Pittsburgh, and it is repeated that first quarter contracts have been closed with favored customers on the basis of 1.40c., Pittsburgh.

Rails.—In the distribution of the Pennsylvania Railroad's rail order of 175,000 tons for 1916, 77,000 tons went to the Steel Corporation, 38,500 to Cambria, 38,500 to Pennsylvania, 10,500 to Bethlehem and 10,500 to Lackawanna.

Billets.—There is less and less disposition to sell billets, and companies whose finishing capacity exceeds their billet capacity will not sell. Quotations continue irregular. Ordinary open-hearth rerolling billets are

nominally \$30 to \$32, with forging billets at \$36 to \$40. Inquiry, both foreign and domestic, continues heavy.

Sheets.—No. 10 blue annealed sheets are quoted by eastern Pennsylvania makers at 1.70c. to 1.80c., Pittsburgh, equivalent to 1.859c. to 1.959c., Philadelphia.

Coke.—Some good inquiries are out for furnace coke. For spot, quotations range from \$2.85 per net ton at oven upward. Prompt is about \$2.75. First half contract furnace coke is quoted at \$2.50 upward, and for all of next year at \$2.35 upward. Prompt foundry is quoted at \$2.75 to \$2.85 per net ton at oven and contract at \$2.75 to \$3.

Old Material.—Some good but not particularly heavy buying of heavy melting steel has been done in the week. Machine shop turnings have been inquired for by a Phoenixville consumer. Quotations for delivery in buyers' yards in this district, covering eastern Pennsylvania and taking in freight rates from 35c. to \$1.35 per gross ton, are as follows:

No. 1 heavy melting steel.....	\$14.50 to \$15.00
Old steel rails, rerolling.....	15.50 to 16.00
Low phos. heavy melting steel scrap.....	20.00 to 20.50
Old steel axles.....	19.50 to 20.50
Old iron axles.....	22.00 to 23.00
Old iron rails.....	17.50 to 18.00
Old carwheels.....	13.75 to 14.25
No. 1 railroad wrought.....	16.00 to 16.50
Wrought-iron pipe.....	13.50 to 14.00
No. 1 forge fire.....	11.25 to 11.75
Bundled sheets.....	11.00 to 11.50
No. 2 busheling.....	9.50 to 10.00
Machine shop turnings.....	10.00 to 10.25
Cast borings.....	10.00 to 10.50
No. 1 cast.....	14.00 to 14.50
Grate bars, railroad.....	10.50 to 11.00
Stove plate.....	10.50 to 11.00
Railroad malleable.....	10.50 to 11.00

Buffalo

BUFFALO, N. Y., Nov. 2, 1915.

Pig Iron.—Buffalo district furnaces booked orders for approximately 100,000 tons during the past week. The bulk of it was comprised of 70,000 tons of hot metal purchased by the Lackawanna Steel Company from the Susquehanna furnaces of the Rogers-Brown Iron Company for delivery over the first six months of 1916. The remainder consisted of various grades of foundry iron, malleable and basic. Shipments on contracts are going forward in tremendous volume, the aggregate tonnage for October being larger than ever before for a like period. The total was increased by heavy shipments by the Genesee furnace of Rochester, which has recently booked large orders. It is estimated that stocks of furnaces are being depleted at the rate of 1000 to 1500 tons daily. Producers are apparently unable to forward iron fast enough to satisfy consumers. The demand for charcoal iron is also heavy and insistent. Producers and dealers are hampered in deliveries by the scarcity of freight carrier capacity down the lakes. Sales have been large and charcoal iron prices have advanced \$1 per ton. The price situation for foundry grades, malleable and basic, in the light of the large sales recently made, is naturally very strong, and there are some indications of impending price increases, but for the present the price list effective for the last two or three weeks is continued, as below, for current and first quarter delivery, f.o.b., furnace, Buffalo:

Foundry of 4 to 5 per cent silicon.....	\$17.00
No. 1 foundry.....	\$16.25 to 16.50
No. 2 X foundry.....	15.50 to 16.00
No. 2 plain.....	15.50 to 15.75
No. 3 foundry.....	15.50
Gray forge.....	15.50
Malleable.....	15.50 to 16.00
Bessemer.....	16.00 to 16.50
Basic.....	16.50
Charcoal—regular brands and analysis 17.75 to 18.75	
Charcoal—special brands and analysis 21.00 to 22.00	

Finished Iron and Steel.—The scarcity of steel for finished products is pronounced. Mills are declining to entertain inquiries from others than old established customers, and a number of leading producers have reached a point where they will be forced to decline accepting any additional tonnage, even from old clients. The situation is especially acute in wire products, and several of the principal producers have entirely withdrawn from the market. A number of in-

quiries are finding their way to the mills for quotations on sheets for the first quarter. Buyers realize that with the high prices being asked for sheet-bars, prices are likely to be considerably higher, rather than lower. Mills are declining to entertain tin-plate business, although considerable pressure is being brought to bear by buyers. Specifications received by several of the selling agencies for the month of October are the largest for any month in the history of their offices. The minimum asking price for bars, plates and shapes is 1.50c., Pittsburgh, and is for immediate acceptance, subject to change without notice and shipment at mills' convenience. Deliveries are now generally four to five months for bars, three to four months for hoops; 90 days for structural shapes, small sections and 60 days, larger sections, and plates, 60 to 90 days. The leading interest announces a further advance in warehouse prices of \$1 per ton in all lines, making bars 2.10c. and structural shapes and plates 2.20c., f.o.b., cars, Buffalo. To these prices 5c. extra will be added for "store-door" delivery. The principal selling agencies are now quoting a minimum of 57 per cent off on cold-finished steel, carload lots. Bids are being received until Nov. 16 for steel for the Buffalo City Hospital, involving about 800 tons. The Ferguson Steel & Iron Company has 100 tons for extension for the J. P. Devine Company, Buffalo.

Old Material.—The market is active and buoyant, and inquiries are coming in at a rapid rate for practically all grades. While in many lines prices have not yet advanced materially over last week, indications point to an early increase all along the line and advances on several commodities have already been made. Low phosphorus steel is strong at 50c. per ton advance, now commanding \$18 to \$18.50. Locomotive grate bars are up \$1 per ton, now being quoted at \$10.50 to \$11. Old carwheels, railroad malleable, old iron rails and No. 1 and No. 2 busheling scrap have each advanced 50c. per ton over last week. We quote dealers' asking prices, per gross ton, f.o.b. Buffalo, as follows:

Heavy melting steel.....	\$13.25 to \$13.75
Low phosphorus steel.....	18.00 to 18.50
No. 1 railroad wrought scrap.....	12.50 to 13.00
No. 1 railroad and machinery cast.....	13.25 to 13.75
Old steel axles.....	19.00 to 19.50
Old iron axles.....	19.50 to 20.00
Old carwheels.....	13.25 to 13.75
Railroad malleable.....	13.00 to 13.50
Machine shop turnings.....	6.50 to 7.00
Heavy axle turnings.....	10.00 to 10.50
Clean cast borings.....	7.50 to 7.75
Old iron rails.....	16.00 to 16.50
Locomotive grate bars.....	10.50 to 11.00
Stove plate (net ton).....	8.50 to 9.00
Wrought pipe.....	10.50 to 11.00
Bundled sheet scrap.....	9.50 to 10.00
No. 1 busheling scrap.....	11.00 to 11.50
No. 2 busheling scrap.....	9.50 to 10.00
Bundled tin scrap.....	10.00

Cincinnati

CINCINNATI, OHIO, Nov. 3, 1915.—(By Wire.)

Pig Iron.—Further price advances have been made, and the minimum on Southern No. 2 foundry is now \$13, Birmingham basis, for shipment this year. The majority of Southern producers are holding for \$13.50 and one at \$14 for first half business; however, some Southern iron can be bought at \$13 with shipments extending through the first quarter. Northern No. 2 foundry, basic and malleable, are now quoted at \$16, Ironton, for either prompt or first half movement. Lake Superior charcoal has also been marked up \$1 per ton. While foundry iron sales have been somewhat scattered in this territory, the total business booked the past week is considerably above general estimates made by individual firms, as most orders were booked by direct solicitation of salesmen and were not openly bid on. Two 500-ton sales of Northern foundry for first half shipment are reported in southern Ohio and 1000 tons was taken by a central Ohio melter, also numerous scattered lots were booked by Indiana customers. In the list of Southern foundry iron transactions there are several lots ranging from 100 to 600 tons going to Indiana and Ohio consumers, all of which are for shipment before July 1. Some Virginia foundry iron has also been sold in this territory lately, and

Two southern Ohio consumers took 500 tons each for first quarter. Other smaller tonnages were also disposed of, mostly for nearby delivery. Both malleable and Lake Superior charcoal irons have been active. We note a 1000-ton first half sale of malleable to an Ohio melter and a like tonnage for an Indiana consumer and one 500-ton lot for a Michigan manufacturer. Charcoal iron sales include two lots of 500 tons to Michigan consumers and 600 tons for a central Ohio melter. Not much business is reported the past few days in the high silicon irons. It is generally understood that practically all of the above mentioned sales were made before the price advances noted, although some contracts have the new quotations inserted. Local firms are working on an inquiry for approximately 3000 tons of low grade Southern foundry iron for first half shipment. Based on freight rates of \$2.90 from Birmingham and \$1.26 from Ironton, we quote, f.o.b. Cincinnati, as follows:

Southern coke, No. 1 f'dry and 1 soft.	\$16.40 to \$16.90
Southern coke, No. 2 f'dry and 2 soft.	15.90 to 16.40
Southern coke, No. 3 foundry.	15.40 to 15.90
Southern No. 4 foundry.	14.90 to 15.40
Southern gray forge.	14.40 to 14.90
Ohio silvery, 8 per cent silicon.	20.76
Southern Ohio coke, No. 1.	18.26 to 18.76
Southern Ohio coke, No. 2.	17.26 to 17.76
Southern Ohio coke, No. 3.	17.01 to 17.26
Southern Ohio malleable Bessemer.	17.26 to 17.51
Basic, Northern.	17.26 to 17.51
Lake Superior charcoal.	17.70 to 18.70
Standard Southern carwheel.	24.40 to 24.90

(By Mail)

Finished Material.—Both black and galvanized sheets are firming up somewhat, and the quotation named by nearby mills to-day for No. 28 black is 2.15c., Pittsburgh basis, and for No. 28 galvanized is 3.75c. The local jobbers' quotation on galvanized sheets is 2.25c. and on No. 10 blue annealed 2.20c. Considerable business for nearby shipment is reported by both mills and jobbers. The growing scarcity of sheet bars reported will undoubtedly exert a further strengthening influence on the market at an early date. The local wholesalers of wire nails and barb wire have marked up quotations to 2c. and 2.85c. respectively. An improvement is noted in specifications for railroad track material.

Old Material.—The market continues to advance, and approximately 25c. per ton has been added to all quotations, though it is probable that both No. 1 railroad wrought and No. 1 machinery cast scrap have registered above this figure. The rolling mills are buying heavily and the stove foundries are also taking more scrap than for a long time. The minimum figures given below represent what dealers are willing to pay for delivery in their yards, southern Ohio, and Cincinnati and the maximum quotations are dealers' prices, f.o.b., at yards:

<i>Per Gross Ton</i>	
Bundled sheet scrap.	\$9.50 to \$10.00
Old iron rails.	13.25 to 13.75
Relaying rails, 50 lb. and up.	21.00 to 21.50
Rerolling steel rails.	12.25 to 12.75
Heavy melting steel scrap.	11.25 to 11.75
Steel rails for melting.	11.25 to 11.75

<i>Per Net Ton</i>	
No. 1 railroad wrought.	\$10.25 to \$10.75
Cast borings.	6.75 to 7.25
Steel turnings.	6.25 to 6.75
Railroad cast scrap.	10.75 to 11.25
No. 1 machinery cast scrap.	12.25 to 12.75
Burnt scrap.	7.75 to 8.25
Old iron axles.	16.50 to 17.00
Locomotive tires (smooth inside).	10.50 to 11.00
Pipes and flues.	8.00 to 8.50
Malleable and steel scrap.	9.25 to 9.75
Railroad tank and sheet scrap.	7.25 to 8.50

Coke.—Prices in the Connellsville field for spot coke are so much disturbed that no quotations of accuracy can be named. A few producers have advanced to \$2.75 per net ton at oven for prompt shipment 48-hr. coke, but are willing to take contract business as low as \$2.40. This is attributed to the small amount of coke on hand. Foundry coke is quoted at \$2.65 to \$3.25. Wise County and Pocahontas operators are naming more uniform prices, and we quote furnace coke in both districts at \$2.50 to \$2.75 per net ton at oven, with foundry grades ranging from \$2.75 to \$3.25. No furnace coke business is in sight in this territory,

and the foundry inquiry is somewhat lighter. The stove makers are consuming more coke than for some time, but the demand from that source is yet far below normal.

Cleveland

CLEVELAND, OHIO, Nov. 2, 1915.

Iron Ore.—Several additional inquiries for small lots of ore have come out, but sellers have been unable to take any of this business because they cannot secure vessels to bring the ore down before the close of navigation. There is little prospect that the vessel situation will ease up so that boats can be had for additional ore. An early buying movement for next year is looked for, and while it is generally considered that next season's prices will be 50c. higher than this year, there is some talk that the advance will be more than 50c. Reports from some of the docks indicate that October shipments show a falling off as compared with September, owing to the heavy demand for boats for the grain trade. We quote prices as follows delivered the lower lake ports: Old-range Bessemer \$3.85, Messaba Bessemer \$3.48, Old-range non-Bessemer, \$3.00, Messaba non-Bessemer \$2.85.

Pig Iron.—The demand for foundry iron is fairly active in the northern Ohio territory, but the market appears to have quieted down somewhat in the surrounding districts, due possibly to the higher prices prevailing. Valley makers have advanced prices 50c. a ton on foundry iron to \$15.50 for No. 2, at which some sales have been made, and they are asking the same price for basic. Local prices for Cleveland delivery are now on a \$16 basis for foundry iron, one interest that recently put its price up to \$15.50 having made a further advance to \$16. However, Cleveland iron can still be had at \$15.50 for out of town shipment. At Toledo foundry and malleable iron are quoted at \$16 at furnace and in Detroit some foundry iron has been sold higher than \$16. We note a number of sales in the northern Ohio territory at \$15.50 for No. 2 foundry in lots up to 1000 tons. An Indiana melter has taken 1000 tons of malleable iron at \$16 for the first half. Southern iron is generally quoted at \$12.50 to \$13, Birmingham, for No. 2. However, a local sale of some spot iron is reported at \$12 and a 500-ton lot for the first half has been taken at \$13.50. We quote, delivered Cleveland, as follows:

Bessemer.	\$16.95
Basic.	15.95
Northern No. 2 foundry.	16.30
Southern No. 2 foundry.	\$16.50 to 17.00
Gray forge.	15.80
Jackson Co. silvery, 8 per cent silicon.	20.12 to 20.62
Standard low phosphorus, Valley furnace.	26.00

Coke.—Furnace coke for prompt shipment is firmer, being quoted at \$2.75 to \$2.85 per net ton at oven for standard makes for prompt shipment. Prices are also higher on foundry coke. We quote standard Connellsville foundry coke at \$3 to \$3.25, the latter price being asked by some makers for contracts, and some business has been taken at \$3.25.

Finished Iron and Steel.—Demand for contract material continues heavy, but several of the mills are entirely out of the market, having enough orders on their books to keep their plants running full during the first quarter or longer. Specifications are very heavy, and many consumers have sent in orders far in excess of their monthly allotments, some having specified for much of their first quarter tonnage. With the improvement in business many buyers are short of steel, not having placed contracts for sufficient material for their last quarter requirements, and wish to place additional orders. Prices are very firm at 1.50c., Pittsburgh, as a minimum for plates, steel bars and structural material. A local mill has advanced its price for plates to 1.60c., Pittsburgh, and an Eastern mill is asking 1.75c., Pittsburgh, for plates for early shipment. The American Shipbuilding Company has placed 12,575 additional tons of plates and shapes for eight boats. All or nearly all of this steel will be furnished by the Car-

negie Steel Company. The contract for 485 tons of steel for the Tod House, Youngstown, Ohio, has been placed with the W. M. Kratzer Company, Pittsburgh. A new inquiry has come from a Youngstown manufacturer for 3500 tons of 4 1/2-in. rounds for shells for England. The scarcity of forging billets is more acute, and sales have been made at higher than \$45, Pittsburgh. Hard steel has been advanced \$1 a ton to 1.40c., Pittsburgh. Bar iron is quoted at 1.50c., Pittsburgh. One maker has advanced railroad spikes to 1.75c. Blue annealed and galvanized sheets are higher. We quote sheets at 2.10c. to 2.20c., at mill, for No. 28 black; 1.70c. to 1.75c. for No. 10 blue annealed, and 3.60c. to 3.70c. for No. 28 galvanized. The demand is heavy, and some of the mills are sold up so far ahead that they are not taking additional orders. Warehouse prices are 2.10c. for steel bars and 2.20c. for plates and structural material.

Bolts, Nuts and Rivets.—A sharp advance in the price of bolts, nuts and rivets has been made as a result of the advance in steel prices and the difficulty of securing material. The advance on bolts and nuts is from 10 to 20 per cent. Up to the present time the advance has not kept pace with the advance in steel prices. The demand from railroads has improved, and some first half contracts have been made at the new prices. With the prevailing higher prices the usual differential on hexagon nuts has disappeared, one price being named for all sizes. Effective Nov. 1 rivet prices were advanced \$7 per ton to 2.25c., Pittsburgh, for structural and 2.35c. for boiler rivets for carload lots for prompt shipment and the first quarter. Bolt and nut discounts are as follows: Common carriage bolts, 3/8 x 6 in., smaller or shorter, rolled thread, 75 and 10 per cent; cut thread, 75 and 5, larger or longer, 70; machine bolts with h.p. nuts, 3/8 x 4 in., smaller or shorter, rolled thread, 75, 10 and 5; cut thread, 75 and 10, larger and longer 70 and 5; lag bolts, gimlet or cone point, 80; square h.p. nuts, blank or tapped, \$5.40 off the list; hexagon h.p. nuts, blank or tapped, \$5.70 off; c.p.c. and T-square nuts, blank or tapped, \$4.80 off; hexagon nuts, all sizes, \$6.25 off; cold pressed semi-finished hexagon nuts, all sizes, 80, 10 and 5 off.

Old Material.—The scrap market is fairly active and very firm. Several grades have advanced 50c. a ton. Dealers are looking for still higher prices and are refusing to sell short, and those having stocks are holding them for an advance. Sales during the week were confined mostly to small lots. There was some activity in heavy melting steel in Youngstown, where the price ranges from \$14.25 to \$14.75. Among the railroad lists for November is a large amount of scrap offered by the Baltimore & Ohio Road, including 3000 tons of steel rails. We quote, f.o.b. Cleveland, as follows:

Per Gross Ton	
Old steel rails	\$13.50 to \$13.75
Old iron rails	14.50 to 15.00
Steel car axles	19.00 to 20.00
Heavy melting steel	13.00 to 13.25
Old carwheels	11.75 to 12.00
Relaying rails, 50 lb. and over	22.50
Agricultural malleable	11.50 to 12.00
Railroad malleable	13.25 to 13.50
Steel axle turnings	11.50 to 12.00
Light bundled sheet scrap	11.50 to 11.75

Per Net Ton	
Iron car axles	\$17.25 to \$17.75
Cast borings	6.75 to 7.00
Iron and steel turnings and drillings	6.00 to 6.25
No. 1 busheling	11.00 to 11.25
No. 1 railroad wrought	12.75 to 13.25
No. 1 cast	11.25 to 11.75
Railroad grate bars	9.50
Stove plate	9.25 to 9.50

The Sullivan Machinery Company removed its St. Louis branch sales office from 705 Olive Street to 2006 Railway Exchange Building. This will give the company more space and enable it to give better attention to the requirements of the customers in the territory served by the St. Louis office.

The Buckeye Engine Company, Salem, Ohio, has increased its capital stock from \$300,000 to \$400,000. This is said to be a step in a movement to take the company out of the receivership under which its affairs have been managed for some time.

Birmingham

BIRMINGHAM, ALA., Nov. 1, 1915.

Pig Iron.—October sales by the two actively selling makers were heavier than in some months. One having two active stacks and a third going in this week sold 50,000 tons for practically all-Southern delivery. The other, the largest foundry-iron manufacturer, and with the largest stock accumulations, is credited with anywhere from 75,000 to 100,000 tons. The leading interest has sold around 10,000 tons for delivery in 1916 at \$13.50 for first half and one other has disposed of a good tonnage for 1916 at \$13 and \$13.50, the former figure being paid on firm offers and the latter by some consumers who took some for second as well as first quarter. The majority of 1916 iron has been sold around \$13, but at the end of last week that price was being withdrawn and \$13.50 asked for the entire first half. The leading interest has only the one price, \$13.50; one other was getting that in some cases and \$13 in others; while the third active interest was getting \$13 for first half. All indications point to \$13 spot and \$13.50 for first half of 1916 as the minimum November price. The Sloss-Sheffield and Republic companies have both sold over their make in October, the former doing a considerable foreign as well as domestic business. One round lot of No. 3 for Mediterranean spot delivery was sold by the Sloss-Sheffield Company for \$12.50 cash. The Woodward Company remains inactive as to selling, is shipping heavily and evidently awaits further advances before entering on a large scale. The Republic Company is resuming this week at its third Thomas stack. The Sloss-Sheffield's fifth will go in by Nov. 15. One Shelby charcoal furnace has resumed with an active charcoal demand. The Alabama Company proposes to put in a second stack at Ironton on its Clifton brand early in January. It is selling its full make at \$1 to \$1.50 per ton over regular foundry prices. The stove manufacturers have finally become busy, and are now busier than in a long time. Small foundries are also more active. Domestic business is steadily improving. Shipments are heavy and orders to rush metal ordered are for the first time coming from the small Southern consumers. Steel mills repeat the thrice-told tale of "at capacity" or on double turn, with orders booked for enough war munition shapes, wire and rails to guarantee steady operations for some time to come. Payrolls, already the largest on record, still climb, especially with the Steel Corporation's Alabama subsidiaries. We quote, per gross ton, f.o.b. Birmingham district furnaces, for spot and 1916 as follows:

No. 1 foundry and soft	\$13.50 to \$14.00
No. 2 foundry and soft	13.00 to 13.50
No. 3 foundry	12.50 to 13.00
No. 4 foundry	12.25 to 12.75
Gray forge	12.00 to 12.50
Basic	13.00 to 13.50
Charcoal	22.00 to 22.50

Cast-Iron Pipe.—The United States Cast Iron Pipe & Foundry Company is shipping 25 miles of 24 and 48 in. pipe from its Bessemer factory to the city of St. Louis and has enough orders on hand to keep it busy for some time. A quantity of large-sized pipe for South American delivery is expected to be awarded soon to the leading makers, leaving the market open for the small sizes to others. In this way a good business all around is looked for in spite of the present lull. Small sizes are becoming active and lots have been sold at \$23, an advance of \$1. We quote, per net ton, f.o.b. pipe shop yards, as follows: 4-in., \$23; 6-in. and upward, \$21, with \$1 added for gas pipe.

Coke.—Coke is strong and the increased beehive make is taken care of easily with better prices obtained for best grades. Shipments to Texas and the Pacific coast are extensive. Small foundries all over the South are taking greater quantities. Inquiry is quite brisk. Furnace operators are not in the general market, needing their make for their own purposes. We quote, per net ton, f.o.b. oven, as follows: Beehive furnace, \$2.75 to \$3; beehive foundry, \$3 to \$3.25, with more makes than usual selling at \$3.50 and one as high as \$3.75; by-product furnace, \$2.50 to \$2.75; by-product foundry, \$3 to \$3.25.

Old Material.—The scrap market is quite active and quotations are firmly maintained, with an advance in prices imminent. Steel grades are more heavily in demand than can be easily supplied. We quote, per gross ton, f.o.b. dealers' yards, as follows:

Old iron axles	\$13.50 to \$14.00
Old steel axles	13.00 to 13.50
Old iron rails	12.50 to 13.00
No. 1 railroad wrought	9.50 to 10.00
No. 2 railroad wrought	8.50 to 9.00
No. 1 country wrought	8.50 to 9.00
No. 1 machinery cast	9.50 to 10.00
No. 1 steel scrap	9.50 to 10.00
Train carwheels	9.50 to 10.00
Stove plate	8.00 to 8.50

St. Louis

ST. LOUIS, Mo., Nov. 1, 1915.

Pig Iron.—Evidence accumulates that melters have by no means covered their future requirements to any great extent, and furnace representatives are confident that the buying will become sharper as the future needs develop. Sales then made will be at better prices to the furnaces. Sharp advances have been ordered practically all along the line, and the quotations now made here are \$13.50 for last and first quarters for No. 2 Southern foundry, Birmingham, and \$14 for second quarter. Sales reported include one of 3000 tons of No. 2 Northern, two of 400 tons each of Lake Superior charcoal, one of 300 tons of Lake Superior charcoal, one of 500 tons of No. 2 Southern, several of 200 tons of No. 2 Southern, one of 600 tons of No. 2 Southern and quite a variety of smaller lots. Inquiries out include one of 10,000 tons of basic for a steel industry here, with some reports of others to come out shortly.

Coke.—Prices of coke have been sharply advanced to a basis of \$3, Connellsburg, for best selected 72-hr. foundry grades, but the local by-product controls the market, being sold on a basis of about \$4.25 at ovens, which is equivalent to about \$4.75, local delivery, as compared with \$5.80, which would be the cost of Connellsburg foundry coke laid down in St. Louis. On contracts made the specifications are liberal.

Old Material.—Scrap has been firmer, especially in the steel grades, for which there was quite an active demand the last few days of the week, especially for shipment North and East as well as for export. Local industries are beginning to take a little more freely, and the lifting of some of the embargoes would be likely to advance sharply the quotations. Steel axles are still much wanted for foreign export as a substitute for billets. Relaying rails are in demand at rather strong prices. No new lists are out to-day, but the railroads are expected to put out considerable quantities during the week, as is usual the first of the month, particularly in the light of the firmness of prices. We quote dealers' prices, f.o.b. customers' works, St. Louis industrial district, as follows:

Per Gross Ton	
Old iron rails	\$11.75 to \$12.25
Old steel rails, rerolling	12.50 to 13.00
Old steel rails, less than 3 ft.	12.50 to 13.00
Relaying rails, standard section, subject to inspection	21.00 to 23.00
Old carwheels	10.50 to 11.00
No. 1 railroad heavy melting steel scrap	11.50 to 12.00
Heavy shoveling steel	10.50 to 10.75
Frogs, switches and guards cut apart	11.50 to 12.00
Bundled sheet scrap	7.50 to 8.00

Per Net Ton	
Iron angles bars	\$11.75 to \$12.00
Steel angle bars	10.00 to 10.50
Iron car axles	16.25 to 16.50
Steel car axles	16.50 to 17.00
Wrought arch bars and transoms	14.75 to 15.00
No. 1 railroad wrought	10.25 to 10.50
No. 2 railroad wrought	9.75 to 10.25
Railroad springs	11.25 to 11.75
Steel couplers and knuckles	11.00 to 11.50
Locomotive tires, 42 in. and over, smooth inside	12.00 to 12.25
No. 1 dealers' forge	9.25 to 9.50
Mixed borings	6.00 to 6.50
No. 1 busheling	9.00 to 9.50
No. 1 boilers, cut to sheets and rings	7.50 to 8.00
No. 1 railroad cast scrap	10.50 to 10.75
Stove plate and light cast scrap	8.50 to 8.75
Railroad malleable	8.75 to 9.00
Agricultural malleable	7.75 to 8.00
Pipes and flues	7.25 to 7.75
Railroad sheet and tank scrap	7.00 to 7.25
Railroad grate bars	7.00 to 7.50
Machine shop turnings	7.00 to 7.50

Finished Iron and Steel.—Finished products are very firm with deliveries approximately four months away as the best that can be promised. Structural material and tank plates are on a basis of 1.50c., Pittsburgh, with consumers only concerned about the date of delivery. In standard steel rails it is understood that the Missouri, Kansas & Texas receiver has taken 15,000 tons from Pennsylvania Steel Company for use on Texas lines, and there is expectation of a further purchase of 10,000 to 20,000 tons for use elsewhere on the system. A southeast Missouri road is also figuring on about seven miles of standard section rails. In light rails the demand has been active and at firmer prices, with some advance reported over last sales. The condition in the contract market is making the pressure on warehouses strong. We quote for material out of warehouse as follows: Soft steel bars, 2.15c.; iron bars, 2.05c.; structural material, 2.15c.; tank plates, 2.15c.; No. 10 blue annealed sheets, 2.35c.; No. 28 black sheets, cold rolled, one pass, 2.65c.; No. 28 galvanized sheets, black sheet gage, 3.90c.

New York

NEW YORK, Nov. 3, 1915

The volume of business is undoubtedly expanding, while the strength of the market is increasing. New England foundrymen have taken rather heavy quantities of Virginia iron for deliveries running into next year, and the nearby foundry trade has also been active in the market. Orders for 1000 tons have figured quite freely in the business placed. Among the sales by local agencies were two for export, one of 1500 tons and the other of 1000 tons, both foundry iron. A New Jersey inquiry has come out for 2400 tons for first quarter and another is for 500 tons for early shipment. Among pending negotiations is 500 tons for a New York buyer for first half. Chile is inquiring for 500 to 1000 tons. The expectation of much higher prices is indicated by the interest shown by speculative buyers. Some purchases have been made the past week for holding speculatively and inquiries of the same character are in hand. Pennsylvania irons have advanced 50c. per ton. We quote Pennsylvania irons at tidewater as follows for fourth quarter delivery: No. 1 foundry, \$17 to \$17.50; No. 2X, \$16.75 to \$17.25; No. 2 plain, \$16.25 to \$16.75. Buffalo No. 2X at tidewater, \$17.60 to \$18.10. Southern iron at tidewater, \$17.50 to \$17.75 for No. 1 and \$17.25 to \$17.50 for No. 2 foundry and No. 2 soft.

Ferroalloys.—One firm representing a large British producer of ferromanganese estimates its receipts in October at about 4000 tons and has no reason to expect any less in November. Other dealers here expect larger shipments in November than in any of the last two or three months. The fact that receipts in the third quarter are no less than in the second, though much below normal, and also the fact that importations of manganese ore are not far below those of one year ago, despite none from Russia or India, are influences tending to ease the situation. Inquiries for amounts from 50 to 100 tons are fairly numerous, with one for 500 tons. There are sales of small lots at \$100, seaboard. It is stated, but not confirmed, that offerings of both British and domestic ferromanganese have been made and accepted at less than \$100, seaboard. The extent to which the domestic alloy is being sold is not easily determined, but reports of sales from \$100 to \$115, seaboard basis, are heard. A cargo of Cuban manganese ore—the second one of importance—is expected to reach this country this month. Spiegeleisen is active but can be obtained around \$29, furnace, in fair quantities. Ferrosilicon, 50 per cent, is very active, one dealer being sold up into next year. The quotation is \$85 to \$87, Pittsburgh.

Structural Material.—Apartment houses have been prominent in awards for fabricated work, and it is estimated that close to 7500 tons of steel is covered in recent lettings of this class of structures. This includes about 5000 tons regarded as having been placed with the American Bridge Company but without confirmation. Other forms of finished steel than shapes

are moving rapidly to strong price positions. Minimum quotations for attractive lots still indicate some 1.45c., Pittsburgh, possibilities for structural material, though from companies with little to sell for six or more months the minimum is 1.60c., Pittsburgh. Less is heard of weak charges for fabrication. The scope of present fabricated work and the average size are included in the following taken from a list of recent lettings: National Folding Box & Paper Company, New Haven, 600 tons, awarded to Lewis F. Shoemaker & Co.; Southern Railway, 1000 tons, to Virginia Bridge & Iron Works; garage for Brooklyn Edison Company, Quincy Street, Brooklyn, 300 tons, to Levering & Garrigues Company; apartment house for Schuyler Square Company, 450 tons, to Passaic Structural Steel Company; Central Baptist Church, Ninety-second Street and Amsterdam Avenue, 250 tons, to Phoenix Bridge Company; foundry, Bristol, Conn., 700 tons to Levering & Garrigues Company, and parochial school, St. Bernard's, West Thirteenth Street, 400 tons, to Hinkle Iron Company. For mill shipments we quote 1.50c. to 1.60c., Pittsburgh, to which is added 0.169c. for freight, for the delivered New York price. Not much is obtainable this year, but for a lot attractive from the mill standpoint, for delivery as the mill can make it, 1.45c., Pittsburgh, appears possible in one or two instances. Otherwise purchases must be made from warehouses with prices of 2.10c. to 2.15c., New York.

Steel Plates.—The unusual demand for plates has brought an abrupt jump in quotations of \$2 per ton with several mills, or to 1.60c., Pittsburgh. It is doubtful if any mill can do better than three or four weeks in deliveries, while those with little even for first quarter shipment are at 1.50c. So well spoken are plate mills for cars, locomotives and ships, that future business is not sought, and the 1.50c. quotation is in some respects nominal. Some large contracts are however at this writing under consideration by buyers who have taken up the subject earlier than usual. Further car purchases may be noted, 1000 coal cars for the Chesapeake & Ohio, to be built by the Standard Steel Car Company, 1000 more hopper cars for the Baltimore & Ohio, and 4500 more cars for the New York Central Lines than mentioned last week; but most important are about 20,000 cars for two trunk lines the names of which may not yet be stated. The New York Central final distribution is 1500 box cars to Haskell & Barker Car Company, 1000 to Pullman Company, 1000 cars to American Car & Foundry Company, 500 to the Merchants' Despatch Transportation Company and 4500 to the Standard Steel Car Company. The Delaware, Lackawanna & Western is in the market for 500 hopper, 1000 box and 500 gondola cars. Plates are obtainable at 1.60c., Pittsburgh, or 1.769c., New York, in about four weeks, with lower quotation, such as that named by Pittsburgh mills, some time in early 1916. For plates from store, the quotation is 2.10c. to 2.15c., New York.

Iron and Steel Bars.—There is no prompt delivery market. Mills discourage attempts to consider future business, and so there is hardly a future delivery market quotation. Prices range from 1.50c. to 1.60c., Pittsburgh, with not very much doing at the moment, but bar iron, with deliveries in three to four weeks and, in some cases, less, is following the steel market and is now 1.50c., Pittsburgh. A greater divergence in prices is promised, with the higher ones in the nature of premiums, but business is being diverted to an unusually large degree to warehouses. There are cases of large manufacturing consumers who are having difficulty in covering for 1916 needs and so greatly is demand in excess of capacity that some manufacturers, it is suggested, will not be able to make all they could sell, owing to shortage of material. We quote mill shipments of steel bars in 1916 at 1.669c. to 1.769c., New York, and of iron bars at 1.669c. to 1.719c., New York. We quote shipments out of warehouse at 2.05c. to 2.10c., New York.

Cast-Iron Pipe.—Pipe founders report a lively fall trade coming from private buyers, with some contracting for spring delivery. Public lettings have almost ceased, as usual at this time of the year. Prices are

well held, and an advance would not be surprising in view of the higher cost of pig iron. Carload lots of 6-in., class B and heavier, are quoted at \$26 per net ton, tidewater, class A and gas pipe taking an extra of \$1 per ton.

Old Material.—The demand for old material has shown practically no improvement, transactions being few and far apart. Wrought turnings and pipe are weak. Brokers are paying about as follows to local dealers and producers, per gross ton, New York:

Old girder and T rails for melting	\$12.00 to \$12.25
Heavy melting steel scrap	12.00 to 12.25
Rerolling rails	19.50 to 20.00
Iron car axles	13.00 to 13.50
Steel car axles	22.00 to 22.50
No. 1 railroad wrought	22.00 to 23.00
Wrought-iron track scrap	14.00 to 14.50
No. 1 yard wrought, long	13.00 to 13.50
No. 1 yard wrought, short	12.75 to 13.00
Light iron (nominal)	4.00 to 4.25
Cast borings	7.50 to 7.75
Wrought turnings	7.50 to 7.75
Wrought pipe	10.75 to 11.00

Foundries have only bought to cover immediate needs and the market has therefore not been especially active. Prices of cast scrap have not advanced, although the higher prices of pig iron might have been expected to have some effect. Dealers' quotations to consumers of cast scrap are as follows, per gross ton, New York:

Old carwheels	\$12.00 to \$12.50
No. 1 cast (machinery)	12.75 to 13.00
No. 2 cast (heavy)	11.75 to 12.00
Stove plate	9.75 to 10.00
Locomotive grate bars	9.00 to 9.50
Malleable cast (railroad)	10.00 to 10.50

British Market Still Rising

Enormous Needs for Shell Steel—American Tin-Plate Contracts with Scandinavia Cancelled

LONDON, ENGLAND, Nov. 3, 1915.

(By Cable)

Foundry pig iron is firm on better shipments, improved buying and better stocks, as well as because some Cleveland furnaces are to be changed over to hematite iron. There is an upward tendency in hematite iron and it is strong on good export demand, with large domestic needs still remaining to be satisfied and makers unwilling to yield concessions. Iron-ore business is comparatively restricted but large contracts will have to be booked.

Enormous Government requirements for shell steel are beginning to occupy exclusive attention. New inquiry for 2,000,000 tons of such steel is probable. The position in South Wales is regarded as critical, owing to impending government requisition for shell steel absorbing the capacity of works and rendering it impossible for local steel markets to obtain hematite iron and for tin-plate and galvanized sheet makers to obtain local supplies of sheet bars. Several works have closed owing to drought.

Scandinavia has canceled considerable contracts for American tin plates owing to conditions laid down by the British Government and has replaced them with the Welsh plates which partly accounts for advanced prices. Tin plates are firm at 19s. 6d. and upward, owing to high cost of raw material. Good orders for black plates for Japan are going to America because Welsh makers cannot execute them. The government may fix maximum prices for Welsh sheet bars. Small sales have been made at £8 10s. delivered but most makers decline quoting. Recruiting is sucking the labor forces dry and this is bound to entail reduced output of everything but munitions.

The Clydebridge Steel Company, Cambuslang, near Glasgow (capacity 90,000 tons), has been bought by David Colville & Sons, Ltd., and will run exclusively on national orders. France is inquiring for rails and structural steel and also for shell steel and bridge work for early delivery. Practically nothing is being offered by America and freight difficulties appear to increase.

ember 4, 1915

Furnaces in blast are 162, against 160 a year ago. Furnaces in Connal's stores were 130,071 tons at the close of last week, as compared with 131,283 tons a week ago and with 134,594 tons two weeks previous. quote as follows:

In plates, coke 14 x 20, 112 sheets, 108 lb., f.o.b. Wales, 6d. against 188. 6d. last week.
Cleveland pig-iron warrants, 67s. 7½d., against 65s. 6d. a week ago.
No. 2 Cleveland pig iron, maker's price, f.o.b. Middlesbrough, 67s. 9d., against 65s. 9d. a week ago.
Steel black sheets, No. 28, export, f.o.b. Liverpool, £12 against £12 last week.
Steel ship plates, Scotch, delivered local yards, £10 5s., compared with £10 a week ago.
Steel rails, export, f.o.b. works port, £8 17s. 6d.
Hematite pig iron, f.o.b. Tees, 115s., as compared with 115s. a week ago.
Sheet bars (Welsh), delivered at works in Swansea Valley, 18 10s., against 17 10s. and upward a week ago.
Steel joists, 15 in., export, f.o.b. Hull or Grimsby, £12, against £11 one week ago.
Steel bars, export, f.o.b. Clyde, £12 10s., compared with £12 last week.
Ferromanganese, f.o.b., £20 15s.
Ferrosilicon, 50 per cent, c.i.f., £24 to £25, against £22 a week ago.

Chicago

CHICAGO, ILL., Nov. 2, 1915.

In tonnage of steel placed with the mills, the past week marked a record for this market. With one instant alone booking approximately 250,000 tons of steel orders from car builders, railroads and bridge shops, a total of 300,000 tons seems a conservative estimate. Inquiry for shapes and plates for cars, following the car orders announced a week ago, closely approached 200,000 tons, and nearly all of this was placed. Railroad buying of tie plates was conspicuous, one road taking 100,000 tons, while fully 65,000 tons was bought in the aggregate. The activity of railroad purchasing could hardly be in more marked contrast to the dilatory habits of long standing.

Pig Iron.—The price of foundry pig iron, 2 to 2.50 cent silicon, jumped last week to \$16.50 at Chicago furnace. A merchant stack at Milwaukee is asking 2.50 cent silicon, which is almost negligible. Just what real relation of sales to production is from the technical standpoint of the ability of the melters to turn iron will doubtless not appear until later. If the assumption grows to the tonnage represented by contracts placed and by inquiry, the maximum furnace production will be taxed to the utmost in meeting the obligations on the books. Book sales for the balance of this year doubtless approach capacity as nearly as sales for the first half, but, if reports are correct, heavy shipments against contracts are relieving the situation somewhat and making the securing of iron for this year's delivery not an impossibility. In the north, producers find themselves equally well sold up. An interesting change in conditions is reflected in the advance of the price of this year's iron from \$12.50 to \$14, while iron for the first quarter has advanced from \$13.50, reversing the situation of a week ago, when the premium was asked for future rather than prompt shipment. The \$12 price appears to have been entirely withdrawn. The leading charcoal-iron interests have advanced their minimum prices for Nos. 2 to 5 to \$15.50 at the furnace. Inquiry for foundry iron continues to appear freely. While coke shipments indicate a substantial improvement in melt, there is no considerable evidence of the belief that a liberal estimate of requirements in making purchases will pave the way to a good investment. We have revised our figures, and the following quotations are for iron delivered at consumers' yards, except those for Northern, malleable Bessemer and basic iron, which are at the furnace, and do not include a switching charge averaging 50c. per ton:

Lake Superior charcoal, Nos. 2 to 5	\$16.15
Lake Superior charcoal, No. 1	17.25
Lake Superior charcoal, No. 6 and Scotch	17.75
Northern coke foundry, No. 1	17.00
Northern coke foundry, No. 2	16.50
Northern coke foundry, No. 3	16.00
Southern coke, No. 1 f'dry and 1 soft	\$18.00 to 18.50
Southern coke, No. 2 f'dry and 2 soft	17.50 to 18.00
Malleable Bessemer	16.50
Standard Bessemer	18.50
Basic	16.00
Low phosphorus	27.00 to 27.50
Silvery, 8 per cent	23.00
Silvery, 10 per cent	23.50

Old Material.—A sharp advance in prices characterized the scrap market of last week, and the tendencies are unquestionably in the direction of still higher levels. A purchase of 15,000 tons of heavy melting steel made last week at a price understood to be \$12.50 could hardly be duplicated, nor was it found possible to buy additional tonnage at a satisfactory price. The prices for the entire list of materials are higher. The advance in the market appears to have been made without particular reference to the volume of sales, being largely in sympathy with Eastern scrap conditions, and the strength of the new material market, although heavier selling prevailed. We quote for delivery at buyers' works, Chicago and vicinity, all freight and transfer charges paid, as follows:

Per Gross Ton	
Old iron rails	\$14.25 to \$14.75
Reyning rails	19.50 to 20.50
Old carwheels	12.50 to 12.75
Old steel rails, rerolling	14.00 to 14.50
Old steel rails, less than 3 ft.	13.75 to 14.25
Heavy melting steel scrap	12.50 to 12.75
Frogs, switches and guards, cut apart	12.50 to 12.75
Shoveling steel	12.00 to 12.50
Steel axle turnings	9.50 to 10.00

Per Net Ton	
Iron angles and splice bars	\$14.50 to \$15.00
Iron arch bars and transoms	15.00 to 15.50
Steel angle bars	11.25 to 11.75
Iron car axles	17.50 to 18.00
Steel car axles	18.50 to 19.00
No. 1 railroad wrought	12.00 to 12.50
No. 2 railroad wrought	11.50 to 12.00
Cut forge	11.50 to 12.00
No. 1 busheling	9.75 to 10.25
No. 2 busheling	7.75 to 8.00
Pipes and flues	8.75 to 9.25
Steel knuckles and couplers	12.00 to 12.50
Steel springs	13.00 to 13.25
No. 1 boilers, cut to sheets and rings	9.00 to 9.50
Boiler punchings	11.75 to 12.00
Locomotive tires, smooth	11.50 to 12.00
Machine shop turnings	7.25 to 7.50
Cast borings	6.50 to 7.00
No. 1 cast scrap	11.75 to 12.25
Stove plate and light cast scrap	8.75 to 9.00
Grate bars	8.75 to 9.00
Railroad malleable	10.50 to 11.00
Agricultural malleable	9.25 to 9.75

Metal Market

NEW YORK, Nov. 3, 1915.

The Week's Prices

Cents Per Pound for Early Delivery								
	Copper, New York	Tin	Lead	Spelter	New	St.	New	
	Lake	Ionic	New	New	St.	New	St.	
Oct.	Electro-	New	St.	New	St.	New	St.	
27...	17.87½	17.87½	33.62½	4.75	4.62½	14.25	14.00	
28...	17.87½	17.87½	34.25	4.75	4.62½	14.75	14.50	
29...	17.87½	17.87½	35.00	4.90	4.80	14.87½	14.62½	
30...	17.87½	17.87½	....	4.90	4.80	14.87½	14.62½
Nov.	1...	17.87½	17.87½	35.87½	4.90	4.80	15.00	14.75

Copper prices show little if any actual change, although a big business has been done and some producers' quotations are higher. Spot tin has advanced over 2c. because of a delayed arrival. Lead was advanced 15 points Friday in a market supposed to be weakening. Spelter has advanced steadily. Antimony is higher principally because of small stocks.

New York

Copper.—It is now certain that at prices ranging from 17.75c. to 17.87½c. cash, New York, recent buying of copper totaled several million pounds. Inasmuch as Lake and electrolytic were quoted at the same level, preference was given to the former, and the Lake interests booked the bulk of the business. Ordinarily prices would have advanced promptly under such a movement, but the Lake interests seemed content to take orders at around 17.87½c. This week there has been less doing and 18c. to 18.25c., full terms, is now

quoted for prime Lake, although it is said that 17.87½c. would still be accepted by practically all sellers. Electrolytic is similarly quoted. The exports of copper made a better showing in October than in recent months, the total being 23,657 tons.

Copper Averages.—The average price of Lake copper for the month of September, based on daily quotations in THE IRON AGE, was 17.89c. and for electrolytic, 17.91c.

Tin.—Deliveries into consumption in October reached the excellent total of 4900 tons, of which 500 tons came to the East from Pacific ports. There was in stocks and landing Oct. 31, 2144 tons. There is now afloat 2668 tons, of which 1100 tons was due to arrive in October on the steamship Indrawadi, but she has been held up by a fire aboard and will not reach port until Nov. 20, if she arrives then. Last Wednesday spot tin was strong and active and the presence in the market of one large inquiry disclosed the fact that some one was short because of the failure of the Indrawadi to arrive. On Thursday the market was firm but rather dull, although there were a few sales of metal afloat. The market was strong on Friday and sales of spot were made at 35c. On that day there was also a fair business in futures and between 300 and 500 tons changed hands. Monday of this week was dull with the quotation at 35.87½c.

Lead.—The leading producing interest surprised the trade last Friday by advancing its price 15 points, or \$3 per ton, making the price per lb. 4.90c. The surprise was occasioned by the fact that, prior to it the market was strong on the surface, but there was an undercurrent of weakness and second-hands were shading prices 2½ to 5 points. The only explanation of the advance is that some large foreign orders were booked. To-day the market is quiet and uncertain. The New York quotation is 4.90c. and that at St. Louis, 4.80c. The October exports totaled 4106 tons.

Spelter.—Throughout the week spelter advanced steadily and on Monday prompt shipments were quoted at 14.75c., St. Louis, and 15c., New York. Deliveries to the end of the year can be had at 13.50c. to 14c., while 12.75c. to 13c. is asked for first quarter. Business has been good, especially in the higher grades. The exports of October reached the large total of 6164 tons.

Antimony.—A fair demand, coming more particularly from war contractors, coupled with the small stocks, has caused Chinese antimony to advance to 35.50c. to 36c. per lb. Future shipments within the year are quoted at 31.25c. in bond, or 34c. to 37.50c., duty paid.

Old Metals.—The market is firm. Dealers' selling prices are as follows:

	Cents per lb.
Copper, heavy and crucible.	16.75 to 17.00
Copper, heavy and wire.	16.25 to 16.50
Copper, light and bottoms.	14.50 to 15.00
Brass, heavy.	11.75 to 12.00
Brass, light.	10.00 to 10.25
Heavy machine composition.	13.50 to 14.00
No. 1 yellow rod brass turnings.	12.50 to 13.00
No. 1 red brass or composition turnings.	12.00 to 13.00
Lead, heavy.	4.25
Lead, tea.	4.00
Zinc.	11.00 to 12.00

St. Louis

Nov. 1.—Non-ferrous metals are much higher, closing to-day as follows: Lead, 5.10c.; spelter, 15c.; tin, 38½c.; Lake copper, 19c.; electrolytic copper, 18.75c.; Japanese antimony, 38c. In the Joplin ore district there was also a decidedly firmer feeling with zinc blende commanding \$80 to \$90 per ton, the premium grades bringing as high as \$93. Calamine was \$55 to \$65. Lead ore sold at \$50 to \$55. Miscellaneous scrap metals are quoted as follows: Light brass, 6.50c.; heavy yellow brass, 8.50c.; heavy red brass and light copper, 10c.; heavy copper and copper wire, 12c.; pewter, 20c.; tin-foil, 26c.; lead, 3.50c.; zinc, 6.50c.; tea lead, 3.50c.

Shipments of iron ore from Cruz Grande, Chile, to Philadelphia via the Panama Canal amounted to 20,400 gross tons in August, 1915.

Iron and Industrial Stocks

NEW YORK, Nov. 3, 1915.

Heavy declines have occurred in certain of the so-called war order stocks in which speculation had been carried to excess, but the general market has been strong with an advancing tendency. Prices on active iron and industrial stocks from Wednesday of last week to Monday of this week (stock exchanges being closed on Tuesday) were as follows:

Allis-Chal., com.	40 1/8 - 43 3/8	Republic, pref.	102 - 104
Allis-Chal., pref.	72 - 75 1/2	Rumely Co., com.	73 - 74
Am. Can., com.	59 3/4 - 63 3/8	Rumely Co., pref.	73 - 74
Am. Can., pref.	106 3/4 - 107 1/2	Sloss, com.	58 1/2 - 60
Am. Car & Fdy., com.	83 1/4 - 88 1/4	Sloss, pref.	52 - 53
Am. Car & Fdy., pref.	116 5/8 - 117 1/4	Pipe, com.	27 - 28
Am. Loco., com.	65 3/4 - 72 1/4	Pipe, pref.	19 1/2 - 21
Am. Loco., pref.	98 3/4 - 99 3/4	U. S. Steel, com.	82 5/8 - 84
Am. Steel Fdries.	65 1/4 - 70 3/4	U. S. Steel, pref.	115 1/4 - 117
Bald. Loco., com.	123 3/4 - 140 3/4	Va. I. C. & Coke,	70 - 73
Beth. Steel, com.	450 - 560	West. Electric,	70 - 73
Beth. Steel, pref.	166 - 171	Am. Radiator,	50 - 52
Colorado Fuel.	54 3/4 - 59 1/4	com.	356 - 360
Deere & Co., pref.	94 - 96	Am. Ship, com.	25 - 26
General Electric.	175 1/2 - 183	Am. Ship, pref.	72 1/2 - 74
Gt. No. Ore, Cert.	48 7/8 - 52 1/2	Chic. Pneu. Tool,	17 - 18
Int. Harv. of N. J., com.	108 - 111	Cambrria Steel,	66 1/2 - 68
Int. Harv. of N. J., pref.	118	Lake Sup. Corp.	95 - 111
Int. Harv. Corp., com.	68	Pa. Steel, com.	80 - 84
Lackawanna Stl.	77 3/4 - 84 1/4	Warwick,	16 1/2 - 18
N. Y. Air Brake.	142 - 148	Cruc. Steel, com.	81 - 85
Nat. En. & Stm., com.	31 - 35	Cruc. Steel, pref.	108 - 117
Nat. En. & Stm., pref.	91 - 92	La Belle Iron,	52 - 54
Pitts. Steel, pref.	96	La Belle Iron, pref.	118 - 123
Pressed Stl., com.	69 3/4 - 76	Am. Brit. Mfg.	com.
Pressed Stl., pref.	105 7/8 - 106	Can. Car & Fdy., com.	27 - 32
Ry. Steel Spring, com.	48 - 51 1/2	Can. Car & Fdy., pref.	105 - 110
Ry. Steel Spring, pref.	97 - 99 1/4	Carbon Stl., com.	96 - 106
Republic, com.	51 3/4 - 55 3/4	Central Fdys., com.	15 - 19
		Central Fdys., pref.	30 - 32
		Dom. Steel, com.	47 1/2 - 52
		Driggs-Seabury,	35 - 47
		Midvale Steel...	86 - 94

Dividends

The Pittsburgh Steel Company, regular quarterly, 1 1/4 per cent on the preferred stock, payable Dec. 1.

The Inland Steel Company, regular quarterly, 2 per cent, payable Dec. 1.

The Eastern Steel Company, regular quarterly, 1 1/4 per cent on the first preferred stock, payable Dec. 15.

The Great Northern Ore Company, 50c., payable Dec. 15.

The New Jersey Zinc Company, regular quarterly, 1 1/4 per cent, payable Nov. 10.

The Pressed Steel Car Company, regular quarterly, 1 1/4 per cent on the preferred stock, payable Nov. 24.

The Standard Sanitary Mfg. Company, regular quarterly, 1 3/4 per cent on the preferred stock and 1 1/2 per cent on the common stock, both payable Oct. 21.

Manganese-Ore Supplies Increasing

Manganese-ore imports into the United States in August were 57,867 gross tons, or nearly three times the imports in August, 1914, when they were 19,639 tons. The receipts in June, July and August this year have in each case exceeded those for the same month in 1914. The total imports for the first 8 months of this year, 145,003 tons, are, however, less than those for the same period a year ago, or 183,029 tons to Sept. 1, 1914. All of this ore has come from Brazil except small consignments from Cuba.

The Phoenix Mfg. Company, Eau Claire, Wis., maker of turret attachments for engine lathes, has opened a branch office for its Eastern trade at 1430 West Sixth Street, Cleveland, Ohio. It is in charge of W. L. Harrison, who has been representing the company in the territory east of Chicago.

Ferrovanadium exports in August were 46,028 lb. against 32,273 lb. in August, 1914. The total exports for the first 8 months of this year were 605,171 lb. against 429,710 lb. and 454,989 lb. to Sept. 1, 1914, and 1913, respectively.

Manganese ore exported from Russia in 1914 was 312,129 metric tons from Batum and 415,016 tons from Poti. In 1913 the exports were 429,900 tons and 649,780 tons respectively. The falling off in the aggregate was thus 352,535 tons.

Program of Mechanical Engineers' Annual Meeting

Power plant papers, papers on machine shop and consideration of industrial safety are among the topics which will be given consideration at the annual meeting of the American Society of Mechanical Engineers to be held in the Engineering Societies Building, New York City, Dec. 7 to 10, inclusive. The program is in part as follows:

Tuesday Evening, Dec. 7

Address by Dr. John A. Brashear, president of the society, followed by a reception by the society.

Wednesday Morning, Dec. 8

Immediately following the business meeting the society will honor the memory of the late Dr. Frederick Taylor, past-president. The proceedings will consist of a report by a special committee appointed by the president to represent the society at the Taylor memorial meeting held in Philadelphia on Oct. 22 under the auspices of the Society to Promote the Science of Management.

The following papers to be presented by title only:

Gas Producers with By-Product Recovery, Arthur H. Smith.

The Application of Engineering Methods to the Problems of the Executive, Director and Trustee, Hollis Godfrey.

Modern Electric Elevator and Elevator Problems, David Lindquist.

Turbines vs. Engines in Units of Small Capacities, J. S. Barstow.

The Conners Creek Plant of the Detroit Edison Company, F. Hirshfeld.

Proportioning Chimneys on a Gas Basis, A. L. Menzin.

These papers are to be presented by abstract:

Design of Fire Tube Boilers and Steam Drums, F. W. Dean.

Higher Steam Pressures, Robert Cramer.

A Novel Method of Handling Boilers to Prevent Corrosion and Scale.

Wednesday Afternoon, Dec. 8.

Electric Operation and Automatic Electric Control for Machine Tools, L. C. Brooks, Jun. Am. Soc. M. E.

Report on Code for Abrasive Wheels.

There will be sessions on railroad and textile sessions simultaneous with the railroad section and in the evening a smoker in the society's rooms.

Thursday Morning, Dec. 9.

The Heat Insulating Properties of Commercial Steam Pipe Covering, L. B. McMillan.

Performance and Design of High Vacuum Surface Condensers, George H. Gibson and Paul A. Bancel.

Circulation in Horizontal Water Tube Boilers, Paul A. Bancel.

Unique Hydraulic Power Plant at the Henry Ford Farms, Mark A. Repplogle.

The Flow of Air Through Thin-Plate Orifices, Ernest O. Hickstein.

Elasticity and Strength of Stoneware and Porcelain, James E. Boyd.

Foundations, Charles T. Main.

Oil Engine Vaporizer Proportions, Louis Illmer.

On Thursday evening will be held the annual reunion, dinner and dance at the Hotel Astor, and on Friday morning an industrial safety meeting.

Papers are in preparation on the following subjects:

Safety Standards in Industrial Establishments.

Modern Movement for Safety from Standpoint of Manufacturers.

Methods of Reducing Accidents Through Cooperative Movements with Workmen.

Compulsory Compensation for Accidents by Law.

The American Shipbuilding Company, Cleveland, Ohio, has taken an order from a Norwegian interest for four boats of the Welland Canal size, this being in addition to the two boats placed by the same interest a few days ago. The same company has taken an order from the George Hall Coal Company for a 244-ft. boat for the coal trade. The Lake shipyards have now lined up about all the work they can promise for delivery next spring. Altogether twenty-six vessels are under contract, seven of which are for bulk freighters.

Youngstown Sheet & Tube Buys Equipment

The Youngstown Sheet & Tube Company, which is making large additions to its plants at Youngstown, Ohio, has recently placed orders for equipment as follows: With the Nordberg Mfg. Company, Milwaukee, Wis., for one 37 x 48 poppet-valve uniflow engine for driving new 9-in. mill, and one 44 x 50 engine of the same type for the 12-in. mill; United Engineering & Foundry Company, Pittsburgh, 75 open-hearth charging cars; William B. Pollock Company, Youngstown, six 260-cu. ft. capacity cinder pots and three standard cinder-pot cars; Fairbanks, Morse & Co., Chicago, coal-handling plant, in connection with the coke plant, to be completed by the latter part of February; Connerville Blower Company, Connerville, Ind., two gas booster blowers, direct connected to Buckeye cross compound engines; Pennsylvania Crusher Company, Philadelphia, two coal breakers and four hammer mills; Babcock & Wilcox Company, three 768-hp. sectional water-tube boilers with superheaters for the new coke plant boiler house No. 9; Wellman-Seaver-Morgan Company, one electrically operated car dumping machine in connection with the coal-handling plant; Henry R. Worthington, water pumps for cooling in connection with coke plants; Baldwin Locomotive Works, two 75-ton six-wheel standard gage switching locomotives. The company has recently installed 12 barb wire machines and 18 more are under contract. Humphrey & Sons are supplying these. In addition two hoop nailing machines have been bought from the Morgan Machinery Company.

Large Exports of Motor Cars

American automobile manufacturers have about doubled their export sales the past year. Government statistics for the fiscal year ended June 30, 1915, show that exports of automobiles and parts thereof amounted to over \$74,000,000, against \$38,000,000 in 1914, \$2,000,000 in 1904 and \$1,000,000 in 1902. The following table shows the contrast for the fiscal year to June 30:

	1914	1915
Commercial cars	\$1,181,611	\$29,140,682
Passenger cars	25,392,962	21,113,953
Tires	3,505,267	4,963,270
Engines	1,391,893	1,405,334
Parts	6,624,232	7,853,183
Total exports	\$38,095,066	\$74,476,422

In July, this year, 2469 commercial cars were exported against 50 in July, 1914, while 4118 passenger cars were sent abroad against 1265 in July, 1914. For 8 months ended Aug. 31, 1915, the exports of commercial cars were 15,042, valued at \$41,886,961, against 509 to Sept. 1, 1914, valued at \$772,257. In passenger cars the exports to Sept. 1, this year, were 26,736, valued at \$23,576,188, compared with 18,884 to Sept. 1, 1914, valued at \$16,612,060.

It is expected, if the record in July and August is maintained, that the total exports for the calendar year of 1915 will exceed \$120,000,000.

The Trumbull Steel Company, Warren, Ohio, has placed an order with the Morgan Engineering Company, Alliance, Ohio, for one 25-ton 4-motor crane, one 20-ton 4-motor crane, two 10-ton 3-motor cranes and one 7½-ton 3-motor crane for installation in an extension to be made to its sheet metal plant.

The Pennsylvania Public Service Commission has announced that it has granted permission to the railroads of the State to continue present rates on pig iron and ingot molds and to abandon the proposed increased rates, which were to have become effective Nov. 1. A protest had been made by shippers.

Platinum, which was \$43.50 per ounce in the first 7 months of 1914, advanced to \$50 in September and receded to \$42 in December, 1914. In October, 1915, it was \$51 to \$55 per ounce.

PERSONAL

L. E. Yost has resigned as superintendent of the open-hearth and blooming-mill department of the Upson Nut Company, Cleveland, Ohio, to take a similar position in the new steel plant of Corrigan, McKinney & Co., Cleveland, the resignation becoming effective Nov. 1. He will be succeeded by R. B. Bostwick, at present superintendent of the open-hearth department No. 3 of the Homestead works of the Carnegie Steel Company, Homestead, Pa.

A. W. Wagner, president of the Terre Haute Malleable & Mfg. Company, Terre Haute, Ind., retired on Oct. 30. His entire interest has been taken over by F. R. Benson and H. L. Arnold who have been associated with him, Mr. Benson becoming president and Mr. Arnold, secretary and treasurer. There is no other change in the organization and the business will be conducted as heretofore.

The Cambria Steel Company, Johnstown, Pa., announces the appointments of T. B. Wilson as steam engineer and M. W. Nolan, as assistant steam engineer, effective at once.

A. M. Soennichsen, one of the founders of the Auto Parts Mfg. Company, Milwaukee, has resigned as general manager to organize the A. M. S. Company, Milwaukee, manufacturer of automobile parts.

Robert E. Ramsay has been appointed advertising manager of the Art Metal Construction Company, Jamestown, N. Y., succeeding Gail Murphy, who has been made advertising manager of the Chalmers Motor Company, Detroit. Mr. Ramsay was for a time assistant advertising manager of the Art Metal Company, retiring from that position in July when he took a tour through the West and to the fairs on the Pacific coast.

Clarence E. Whitney, president Whitney Mfg. Company, Hartford, Conn., has been elected a director of the Hartford Electric Light Company to represent the manufacturing interests of the city on the board.

Clarence A. Earl, Springfield, Mass., vice-president Hendee Mfg. Company, has been elected a director and one of the vice-presidents of the Willys-Overland Company, Toledo, Ohio.

Richard G. Williams, safety engineer, Norton Company, Worcester, Mass., has been appointed chairman of the committee on accident prevention and workmen's compensation of the National Association of Manufacturers, succeeding F. C. Schwedtman.

John M. Higgins, for some years foreman of the pipe mills of the Republic Iron & Steel Company, Youngstown, Ohio, has resigned to accept a position with the H. Koppers Company, Pittsburgh. He was presented with a gold watch by his former employees.

H. H. Mason has resigned as efficiency engineer of the Northway Motor & Mfg. Company, Detroit, Mich., to become assistant to the president of the Ferro Machine & Foundry Company, Cleveland, Ohio.

Federal Furnace Company Taken Over

The By-Products Coke Corporation, operating Solvay by-product coke ovens at South Chicago, Ill., announces through President Hazard the absorption of the Federal Furnace Company. The furnace company, which will be dissolved, has been controlled by the associated interests of Pickands, Brown & Co. and Pickands, Mather & Co. and has operated two blast furnaces for the production of merchant pig iron. The merger is largely one of convenience and is made on the basis of stock transfer only, the capital of the coke corporation being increased at the same time from \$5,000,000 to \$10,000,000.

The Scullin Steel Company, St. Louis, Mo., will erect additions to its plant, included in which will be a two-story service building for employees, with lockers, shower baths, etc., to cost about \$15,000.

Pittsburgh and Nearby Districts

Wednesday, Nov. 3, was the date fixed for a hearing before the Public Utilities Commission at Columbus, Ohio, to take up the question of rates for washing slag and other materials from furnaces and industrial plants, and to receive the statements of representatives of the blast furnaces and steel companies in the Monongahela Valley and elsewhere in Ohio.

The Riter-Conley Mfg. Company, Pittsburgh, has received an order for designing and fabricating the plate material for two 450-ton blast furnaces to be erected by the Han Yeh Ping Iron, Coal & Coke Company, Shanghai, China. About 3000 tons of plate will be used. The building of the furnaces will be done by the Chinese company. It is probable that the furnaces will be driven with turbo-blowers to be bought in Germany, but this has not been fully decided. The Chinese company has sent an inquiry to this country for gas engines, but no contract has been placed. The plate work contract will amount to about \$500,000, and is expected to be completed in six or seven months. The Riter-Conley Company has started work on an addition to the plant of the Trumbull Steel Company, Warren, Ohio, calling for about 1500 tons of structural steel.

The William Tod Company, Youngstown, Ohio, has received an order from the Imperial Steel Works, Osaka, Japan, for a double compound reversing blooming-mill engine and other equipment for a new arm plate mill to be built at Nagasaki, near Osaka. The mill will be two-high reversing, capable of rolling plates up to 6 in. thick and 15 ft. wide for deck protection on battleships. The contract for the mill has been placed with the Morgan Construction Company, Worcester, Mass. The engine will be an exact duplicate of an engine furnished by the Tod Company to the Briar Hill Steel Company, Youngstown, and was developed about 10,000 hp. The mill will be equipped with Tod cut gears, Tod patent pinion drive and Tod patent spindles. The contract calls for delivery within 10 months. The Tod Company is putting through its shops an 800-ton motor-driven shear for the Edgar Thomson steel works of the Carnegie Steel Company, capable of shearing six 4 x 4 in. billets at one time. It has also received an order for a seamless tube mill for the Timken Roller Bearing Company, Canton, Ohio, and is building several flue-dust briquetting machines for the General Briquetting Company, to be installed in the blast furnaces of the Wickwire Steel Company, Buffalo, N. Y. The company has commenced the erection of a lavatory and rest house at its shell department for the accommodation of employees in that department. Shower baths and lockers will be provided for the men, as well as rooms where they can change their clothing after work. It is now operating 72 hours night and day on three 8-hr. shifts.

The Pittsburgh Steel Company has called for redemption \$408,000 6 per cent coupon gold notes, series A, due Jan. 1, 1918. Payment will be made by the Union Trust Company, Pittsburgh, Dec. 1 at face value plus 1 per cent premium and accrued interest.

The Standard Plate Glass Company, Butler, Pa., broke ground recently for an addition to its grinding and polishing shed, 158 x 200 ft., of brick and steel. It will be equipped with electric cranes, motors and the latest glass-working appliances.

The Guarantee Pump Company, Rochester, Pa., with a capital stock of \$100,000, has been incorporated by J. H. Conrad and Eugene Hooper, Beaver; Robert M. Nugent, Staunton, W. Va., and James B. McKenna and George W. McKensie, Jr., Rochester, to manufacture automatic pumps and automobile accessories.

Struble Brothers, Inc., Wilkinsburg, Pa., with a capital of \$10,000, has been incorporated by J. N. Struble, 1119 Rose Avenue, Howard F. Struble, and C. L. Struble, to manufacture steam fittings and galvanized products.

S. R. Dawson, Wheeling, plans to establish a plant at Huntington, W. Va., for the manufacture of wrapping machines.

The Chesapeake & Ohio Railroad, with general offices at Richmond, Va., will build a 6-stall roundhouse at Peachtree, W. Va. F. I. Cabell is chief engineer.

Fast progress is being made on the erection of the emergency hospital of the Youngstown Sheet & Tube Company, Youngstown, Ohio. The building will be of light gray brick with stone trimmings. The hip roof will be of Spanish Imperial tile, lending an impressive effect to the entire building, which will be of Italian renaissance architecture. The size of the structure will be 40 x 85 ft., providing ample room for 10 operating rooms, wards, dispensaries, waiting rooms and offices on the first floor and two great wards with baths, kitchen and other quarters on the second. Rapid progress is also being made on the laboratory building now being erected. It will cover an area of 90 x 115 ft., and will be as nearly fireproof as modern skill can make it. There will be 18 rooms on the first floor, mostly offices, and the second floor will have 12 rooms.

At the recent annual meeting of stockholders of the Westinghouse Air Brake Company, Wilmerding, Pa., H. H. Westinghouse was re-elected president and directors were elected as follows: Cyrus S. Gray, E. M. Herr, A. L. Humphrey, J. R. McGinley, Charles McKnight, John F. Miller, Morris S. Rosenwald, W. D. Uttegraff and H. H. Westinghouse. This company is turning out large quantities of rifles and other war munitions, operating night and day, but the air-brake department is not operating to full capacity.

The application of transcontinental railroads operating from Chicago to Pacific coast terminals, for authority to publish a 55c. through rate from Pittsburgh, will be heard Nov. 12, at Washington, by the Interstate Commerce Commission. If the proposed rate is accepted, the parity between the Pittsburgh and Chicago districts will be restored. The 55c. rate, which, as has been stated, was first proposed by the Pittsburgh-Wabash Terminal Railroad, is favored by transcontinental carriers, who do not want, however, to offer proportionate rates for short hauls.

The new battery of 75 Koppers by-product coke ovens of the Republic Iron & Steel Company at Hasletton, Ohio, was started last week and is now in full operation. This gives the company a total of 143 by-product coke ovens, with a capacity of 64,800 tons of coke per month. The second unit of the benzol plant being constructed to take care of the product of the new ovens is also about ready for operation.

John J. Dick, who has been awarded the general contract for 2000 tons of 6 to 30 in. pipe for East Liverpool, Ohio, has placed the order for the pipe with the Scottdale plant of the United States Cast Iron Pipe & Foundry Company.

The Thomas Carlin's Sons Company, Pittsburgh, reports recent orders for shears from the following: Crucible Steel Company, Atlas Crucible Steel Company, Bossert Company, Coatesville Scrap Iron & Steel Company, Irwin Foundry & Mine Car Company, Midvale Steel & Ordnance Company, Philadelphia Steel & Forge Company, Phillips Sheet & Tin Plate Company, Wolf & Co., and Corrigan, McKinney & Co.

The report that the Pressed Steel Car Company has completed its first order of 7500 cars for Russia and has received a second order for 8500 cars is incorrect. The first order of 7500 cars will not be completed until January or later, and the company has not received any second order from Russia.

W. S. Raw, Pittsburgh, has the general contract for a steel highway bridge at Lyons Falls, N. Y., taking 300 tons of steel.

The Duluth & Iron Range Railroad, through its chief engineer, W. A. Clark, has prepared plans for a new steel and concrete ore dock at Two Harbors, Minn., to have a storage capacity of 68,000 tons.

The Standard Forgings Company, Indiana Harbor, Ind., is about to erect three buildings as an addition to its works, at a cost of \$100,000. The buildings will be of steel construction.

OBITUARY

SYLVESTER CLARK DUNHAM, president Travelers Insurance Company, died Oct. 26, at his home in Hartford, Conn., of pneumonia, aged 69 years. He was an officer and director in several banks, insurance companies and industrial corporations, among them the American Hardware Corporation, Colt's Patent Fire Arms Mfg. Company and Underwood Typewriter Company. He was born in Mansfield, Conn. Following his graduation from the New Britain Normal School, he took up the study of law and was admitted to the bar in 1871. After a short term as city attorney of Hartford, he became secretary of P. & F. Corbin, New Britain. When this concern merged with the Russell & Erwin Mfg. Company in the American Hardware Corporation, he was one of the two lawyers who drew up the articles of incorporation. Mr. Dunham was appointed attorney for the Travelers Insurance Company in 1885, became a director in 1897, vice-president in 1899 and president in 1901. For some years he had been a lecturer at Yale University and recently delivered a series of lectures on the science of insurance which have been published in book form. He was a member of many clubs and honorary organizations.

WIRT DU VIVIER TASSIN, for many years chief chemist and assistant curator of the Division of Mineralogy of the National Museum at Washington, died in that city of heart disease Nov. 2, aged 47 years. He was born at Fort Whipple, Va., and was graduated from Cornell and Harvard. He was special agent of the U. S. Geological Survey at the Chicago Exposition and in 1893 was appointed to the position he occupied when he died where he remained until 1909, resuming the position a few years ago. In the interim he was a consulting metallurgist and chemical engineer in Philadelphia and Washington. Mr. Tassin was the author of many technical papers on mineralogical and metallurgical subjects, his work with the microscope being signal. He invented the Tassin illuminator for improving the light in the taking of photomicrographs. He was a member of the American Chemical Society, the American Society for Testing Materials and a number of others as well as the Cosmos Club of Washington.

CHARLES WALTER HAND, vice-president Underwood Typewriter Company, Hartford, Conn., died suddenly, Oct. 28, at his home in Brooklyn, N. Y. He had been vice-president of the company for about ten years. He was also president of the Davis Oil Company of New York and connected with other business enterprises. He was widely known in Presbyterian circles and held office in many missionary and charitable organizations in New York and Brooklyn.

MARTIN MULLEN, a pioneer coal man of Cleveland, Ohio, died suddenly of heart disease Oct. 27, aged 63 years. He had been active in the coal trade for many years and for the past ten years has been associated with M. A. Hanna & Co. interests in Cleveland.

Cleveland Machinists Call Off Strike

The machinists' strike in Cleveland, Ohio, has been called off by the union leaders and strikers, who have met total defeat in their demands for an 8-hr. day with no reduction in pay. Men have been gradually returning to work the past week. The strike leaders, realizing that their efforts were unsuccessful, called off the strike Nov. 1. The plants affected were those of the Warner & Swasey Company, National-Acme Mfg. Company, Standard Tool Company, Bardons & Oliver Company and the Peerless Motor Car Company, a portion of the men being out at these plants about two weeks. The only plant in which any concessions were made to the strikers was that of the Cleveland Automatic Machine Company, where a strike was called off a few weeks ago as a result of a compromise.

LABOR NEWS OF NEW ENGLAND

Massachusetts Conciliation Board Scores Employers—More Strikes Breaking Out

About 1200 hands employed by the Crompton & Knowles Loom Works have joined the other Worcester strikers. The same demands as presented to the other plants in the city were refused by the officials of that company.

The report of the State Board of Conciliation and Arbitration on the Worcester strikes was issued Oct. 30, in which the Board lays the blame for the continuation of the controversy upon the employers. After reciting the details of the situation at each of the plants affected, the report concludes with these paragraphs:

The State Board finds that the attitude of the employers was determined by them as a result of an understanding with other employers in kindred lines of industry holding membership in the Worcester Branch of the National Metal Trades Association. The demands presented by the employees were in accordance with a concerted movement of men employed in machine-tool industries to secure among other objects a uniform 8-hr. workday. The attitude of employers did not permit of opportunity to the employees to negotiate concerning the acceptance or modification of the terms proposed.

The Board finds that the controversies involving so many employers and employees should have been brought to the attention of the Board and an investigation of conditions of employment which were made the subject of the controversies should have been requested before a strike should have been called. The employers should have discussed with their employees the questions at issue and if they failed to adjust such controversies should have requested a like inquiry and no strike or lockout should have taken place pending such investigation.

The employers declined to join with the employees in a submission of the controversies to arbitration. Had they done so the employees would have been bound to return to work pending such arbitration. The Board finds that the attitude of the employers is not one which makes for industrial peace, and they are responsible for the continuance of the strikes.

The Declaration of Principles, as stated in the book defining the relation of the members of the Metal Trades Association, appears to be a contract between the several members of that association, but it does not appear that it is a contract to which the employees are a party. It nevertheless defines the policy by which members of the association have agreed to be controlled.

It therefore seems the course of dealing contemplated by members of the association is this, so far as it relates to industrial controversies: in the event of a disagreement, relative to wages or conditions of work, it seems to be the duty of the employer as a member of the association to request the employees to join in the form of arbitration defined by the rules of the association, and thereupon to submit the questions for determination to a board consisting of three arbitrators, to be named by each of the parties to the controversy, and to submit to the decision of the arbitrators so chosen.

As the employees are not parties to the agreement existing between the members of the association, it is evident that it was incumbent upon the employer in the performance of his duty to other members of the association to call to the attention of the employees the provisions of the agreement to submit matters in controversy to arbitration in accordance with the form proposed. This failure to do so was a violation of the contract with the association.

The contention of the employers that wages and hours of labor are not proper subjects of arbitration as defined in the Declaration of Principles of the National Metal Trades Association is not sustained by the State Board.

The State Board recommends that the employees or their representatives immediately seek a conference with their respective employers to the end that opportunities may be afforded the parties to obtain an amicable settlement, either by agreement as to wages and hours or agreement upon a form of arbitration by which the controversies may be determined. The Board is informed that the employees are willing to join with the employers in a submission of the matters in dispute to arbitration, to be determined by either the plan proposed by the National Metal Trades Association or by a local board established in accordance with the law, or by the State Board.

The Worcester strikes have continued for six weeks and the situation is still apparently a deadlock.

At Athol, Mass., about half of the employees of the Union Twist Drill Company are out on strike after demands for the 8-hr. day were refused. Some of the

men are returning to work and the strikers are losing strength rather than gaining.

About 350 employees of the Springfield Metal Body Company, Springfield, Mass., went on strike Oct. 26 for the 8-hr. day and other demands. It is reported that Hinsdale Smith, president of the company, has announced that the trouble may result in the removal of the plant to Detroit, Mich., a proposition which has been under consideration for some time.

According to published statements of the officials of the Potter & Johnston Machine Company, Pawtucket, R. I., over 650 of its employees have returned to work, leaving about 150 men on strike. At a meeting Oct. 30, the chairman of the shop committees of the Brown & Sharpe Mfg. Company and Builders Iron Foundry employees tried to secure a vote to call the strike off, but were opposed by the labor organizers and were not successful. It is believed, however, that this move is the beginning of the end of the Providence and Pawtucket troubles.

New troubles have arisen in Hartford, Conn. Some of the employees of the Hart & Hegeman Mfg. Company, Taylor & Fenn Company and Arrow Electric Company have struck for the 8-hr. day. Full reports of the situation are not available, but it is not believed that the trouble will be of long duration in view of the ill success that has attended the strikers' efforts at the Pratt & Whitney plant.

The strikes at New Haven and Meriden, Conn., still continue, with little change reported.

The textile industries are beginning to be affected by labor troubles, particularly at Nashua, N. H., where several thousand employees are out and where a serious situation has been brought about by the violence of the foreign element among the strikers.

W. P. Davis Machine Company Purchased

The W. P. Davis Machine Company, Rochester, N. Y., has been purchased by interests associated with J. M. Fitzgerald, former president of the Western Maryland Railroad Company, and in the future will be known as the Davis Machine Tool Company, Inc. It is the plan of the new owners to spend a considerable sum of money in enlarging the capacity of the plant, though the line will not be increased. It is understood that Mr. Fitzgerald will be president of the new corporation and that F. H. Brown, who has long been associated with the company as secretary and treasurer, will be retained as assistant to the president. The company manufactures turret, chucking and engine lathes, key seaters, drilling and cutting-off machines. Since the war started the company has been concentrating to a large extent on its lathes and cutting-off machines.

Manganese Ore from Virginia

The Crimora Manganese Corporation, 15 Broad Street, New York, announces that its new mill for crushing and washing high grade manganese ore at its mines in Virginia, together with new excavating equipment, is nearing completion and will be operating before Jan. 1, 1916, producing 200 tons of ore per day. Additional removal of overburden on its property is said to have exposed new ore-bearing areas promising to greatly increase recently estimated deposits of 5,000,000 tons.

Ferromanganese Imports Below Normal

Ferromanganese imports into the United States at the four principal Atlantic ports, according to Government data furnished THE IRON AGE, amounted to 20,396 gross tons for July, August and September. This makes total imports for the first nine months of the year 40,801 tons, compared with a normal importation of 75,600 tons based on a 5-year average.

The appraisers of the property of the Canton-Hughes Pump Company, Wooster, Ohio, which recently went into the hands of a receiver, have filed a report showing the company's assets to be \$228,931 and liabilities \$99,370. It is said that its financial troubles are due to lack of working capital. The plant will be offered for sale at public auction Dec. 10.

Machinery Markets and News of the Works

STRIKE TROUBLE ABATING

Cleveland Strike Declared Off

Large Domestic Inquiries Are Lacking, but New Enterprises and Plant Extensions Are Promising for the Future—Russian Trade Good

Reports from all directions indicate a continued betterment in the labor situation. In New England there are sporadic outbreaks which annoy and hamper shop managers, but the general situation is improved. In Cleveland the strikes have been declared off. In Cincinnati the outlook is better, although demands were made on three additional shops last week. At the largest of these only 121 men went out, representing about 15 per cent of the entire force. Employers are not treating with the Union, but are taking back their men as the latter apply as individuals for re-instatement.

The export demand from Russia continues especially good. Large domestic inquiries are not noted, except where a few war contractors are concerned. Makers of munitions are still taking tools, however, and industrial concerns are buying where they can find machines for which they do not have to wait too long. The activity in the steel business has filled the makers of cranes, punches and shears, etc., with work. The number of new enterprises and additions to those already established indicates a heavy demand for machinery in the not far distant future.

New England is experiencing a lack of trained mechanics, which together with the problem of housing the workers, is a more serious problem than the strikes. New York finds a continued strong demand, part of it coming from a fresh crop of would-be buyers in whom the trade has little faith. Much attention was given last week to the convention of the National Machine Tool Builders' Association at New York. The Heron Mfg. Company, Utica, N. Y., has plans for a two-story addition to cost \$100,000.

The Baldwin Locomotive Works have placed an order in Cleveland for 115 lathes, 97 of which are to be large sizes, and all for shell work. There are fewer large domestic orders in that city, but the Russian request is good. The Toledo Machine & Tool Company, Toledo, Ohio, will erect a three-story building, 100 by 400 ft. The Electric Auto-Lite Company, Toledo, will build an addition of three stories, 103 x 385 ft.

The foreign demand shows some diminution in Cincinnati. The Cincinnati Ball Crank Company of that city will build a one-story addition, 100 x 275 ft., and the Hess Spring & Axle Company, also of Cincinnati, is adding 40,000 sq. ft. to its manufacturing space. At Columbus, Ohio, the American Mfg. Company has purchased the plant of the Columbus Machine Tool Company, and will install machinery for the manufacture of

lathes. At Frederick, Md., the Morris Iron & Steel Company will manufacture lathes, an order for 322 machines having been received, according to report.

Chicago notes that the Moline Tool Company, Moline, Ill., will build an addition 150 x 200 ft.; also that the Western State Coke Company, Minneapolis, Minn., will erect extensive machine shops. In Milwaukee there is a shortage of skilled labor, and agitators are trying to stir up trouble, but so far with little success. St. Louis is bare of stock. Birmingham, Ala., complains of inability to get deliveries.

At Fort Wayne, Ind., the Fort Wayne Electric Works will erect a factory to cost \$112,000. The shops of the Texas & Pacific Railroad, Marshall, Tex., will be rebuilt at a cost of \$150,000. The Ogden, Logan & Idaho Railroad, Ogden, Utah, has let contracts for the construction of freight terminals, car barns and repair shops to cost \$200,000.

Over 400 tenders have been received in Canada for the new \$80,000,000 shell contract to be placed there. It is proposed to distribute the orders at a fixed price established by the lowest estimate. Many Canadian companies who have made small caliber shells are now equipped to make sizes up to 6-in. The Canadian Vickers Company, Montreal, will build an addition to its plant for the manufacture of aeroplanes.

New York

NEW YORK, Nov. 3, 1915.

The interest of the local trade was largely absorbed last week by the convention of the National Machine Tool Builders' Association held in this city. The coming to New York of what was, under existing conditions, a surprisingly large number of factory executives, furnished an opportunity, such as is seized always, for conference between executive and production heads and selling forces. How deliveries can be handled, or not handled, and demands for machines parried, were of course the vital questions discussed.

The demand for tools continues strong, and there is an increase in the amount of shopping by would-be buyers, a result of the scarcity of tools. Many of the purchases sought to be made are declared to be most inadvisable. Further condemnation is heard of the crudity of certain machines recently placed on the market. Orders for large groups of these machines are being placed for export.

The activity in the steel business has given some of the crane builders all the work they can handle. The ship-builders also have been good buyers. The Baltimore Dry Dock & Shipbuilding Company, Baltimore, has placed orders for several cranes, as well as for a good-sized list of punching and shearing machinery. Cranes have been purchased also by the Bethlehem Steel Company and the Pennsylvania Steel Company. The Birdsboro Steel Foundry & Machine Company, Birdsboro, Pa., is in the market for one 30-ton and one 10-ton crane, and is expected to buy other equipment also. The Fore River Shipbuilding Corporation has closed against an extensive list of punching and shearing machines.

It is reported that the Remington Arms & Ammunition Company, Bridgeport, Conn., has leased for a long term the twelve-story building known as unit D in the Hoboken Terminal, Hoboken, N. J. It contains 275,000 sq. ft. of floor space. Details as to its use are not available.

The Clark Razor Blade Company, 56 Summer Avenue, Newark, N. J., has purchased a site at 205-211 Railroad Avenue and will erect an eight-story factory to cost about \$50,000.

The Studebaker Corporation, South Bend, Ind., will erect a four-story building at Long Island City, N. Y., 80 x 160 ft., for use as a service station and also for tuning up the cars shipped from the Detroit factory. A repair department will be maintained in connection with the service station and the whole building is expected to be ready Dec. 1.

The Chevrolet Motor Company, 816 Eleventh Avenue, New York City, has purchased the northeast corner of Eleventh Avenue and Fifty-fifth Street, New York, containing a site 25 x 100 ft., and has leased fifteen surrounding lots constituting the entire block on Eleventh Avenue from Fifty-fifth to Fifty-sixth Streets with a frontage of 200 ft. on both streets. The property has been acquired in connection with the New York City service station for the company.

The Turner Construction Company, 11 Broadway, New York, has been awarded the contract by the Carborundum Company, Niagara Falls, N. Y., for the construction of an addition to its kiln building, 80 x 144 ft., two stories, of reinforced concrete.

The Eastern Tool & Mfg. Company, 74 Richmond Street, Newark, N. J., manufacturer of wire specialties, tools and special machinery, plans the erection of a factory at Grove Street and the Erie Railroad, but has not worked out its details. C. E. Peterson is manager.

The damage to the Syracuse Architectural Iron Works of the Smith & Caffrey Company, Syracuse, N. Y., by fire Oct. 13, destroyed the structural, ornamental, machine and pattern shops, but did not injure to any extent the foundry, which was running the second day after the fire. The company is now erecting a temporary shop. It is expected that a new plant will be ready for use in the spring.

The Morrow Mfg. Company, Elmira, N. Y., has purchased about 13 acres adjoining its plant for future expansion, and will construct a new heating plant for its entire factories at a cost of about \$100,000.

E. C. Stearns & Co., Syracuse, N. Y., makers of gray-iron castings, wood and metal patterns, etc., have purchased the business of the National Incinerator Company, 303 Fifth Avenue, New York City, manufacturer of household refuse incinerators.

The Turner Construction Company, 11 Broadway, New York, has been awarded the contract by the Automatic Transportation Company, Main Street, Buffalo, N. Y., for the construction of a warehouse and blacksmith shop, 53 x 146 ft., of brick and reinforced concrete.

The Heron Mfg. Company, Utica, N. Y., manufacturer of casters, connecting rods for automobiles, etc., plans the immediate erection of a two-story building, 85 x 150 ft., to cost about \$100,000. It will be equipped with the latest type of machinery. W. F. Foster is president.

Carl Schoenert & Sons, manufacturers of tools, automatic machinery, etc., 633 South Twentieth Street, Newark, N. J., will erect a two-story manufacturing building and will extend its present building.

The Vitaphone Company, manufacturer of talking machines, etc., Plainfield, N. J., will erect a brass foundry, but has put over the time for beginning construction indefinitely. W. C. Simpson is factory manager.

Charles Cooper & Co., 348 Van Buren Street, Newark, N. J., manufacturing chemists, have awarded contract to the Becker Construction Company, 320 North Sixth Street, Newark, N. J., for the construction of a one-story brick factory building, 50 x 125 ft., to be erected on Tyler Street, near South, at a cost of about \$5,000.

The Reliance Motion Picture Corporation, Yonkers, N. Y., has completed plans for the erection of studios, powerhouse and shops on Riverdale Avenue at an estimated cost of \$40,000.

The Jenson Creamery Machinery Company, Kerhonkson, N. Y., has been incorporated with a capitalization of \$200,000 to manufacture creamery machinery, etc. E. T. Magoffin, 30 Evergreen Place, and P. S. Hill, 615 West 142nd Street, New York City, are among the incorporators.

Articles of incorporation have been issued to the Rochester Trailer Company, East Rochester, N. Y., with a capital stock of \$25,000 to manufacture automobiles, trucks, trailers, hearses, etc. K. Gleason, Pittsford, N. Y.; C. H. Babcock, 22 Berkeley Street, Rochester, and E. E. Keller, 720 Jefferson Avenue, Detroit, Mich., are the incorporators.

The Contractors' Plant Mfg. Company, Henry Street and the Erie Canal, Buffalo, will add a machine shop, 57 x 129 ft., of brick and steel, to its plant at a cost of \$15,000.

The Cortland Munitions Company, Cortland, N. Y., has filed incorporation papers to manufacture firearms, ammunition, etc. The capital stock is \$50,000. C. P. Seymour, H. M. Glenn and C. O. Moore, Cortland, are the incorporators.

The Unique Brass Foundry Company, 25 Illinois Street,

Buffalo, has let contract for a foundry and machine shop, 85 x 136 ft., one and two stories, of brick and steel, to cost \$23,000, and to be erected at Grant Street and the New York Central Railroad.

The Jewell Steel & Malleable Company, Buffalo, is enlarging its foundry at Hertel Avenue and the New York Central Railroad.

The N. B. Fails Lubricating Company, Buffalo, is building an addition to its plant at Manitoba Street and the Erie Railroad.

The J. P. Devine Company, Buffalo, manufacturer of vacuum drying apparatus, is building an addition 60 x 200 ft., of tile and concrete, to its plant at Clinton Street and the Erie Railroad.

Bids are being received by the State Hospital Commission, E. S. Elwood, secretary, Albany, N. Y., for additional boiler capacity and heating apparatus for the Buffalo State Hospital.

Sealed bids will be received until Nov. 16 by the Buffalo City Hospital Commission, Thomas W. Jordan, secretary; Edward J. Meyer, president, for six buildings, power-plant, heating and ventilating apparatus, electrical work, etc., estimated to cost \$500,000. Plans are by Green & Wicks, architects, Austin Building, Buffalo.

Contract has been awarded to R. D. Wood, Philadelphia, Pa., at \$80,900 for construction of a pumping station at Tivoli Street for the sewer system of Albany, N. Y.

Philadelphia

PHILADELPHIA, PA., Nov. 1, 1915.

The Girard Iron Works, manufacturer of machine castings, Twenty-second and Master streets, Philadelphia, Pa., has purchased the property of the old Tioga Foundry Company at Twenty-second Street and Allegheny Avenue, 134 x 240 ft., where it will begin casting operations Dec. 1. George S. Rominger is president.

The American Engineering Company, machinist and founder, Aramingo and Cumberland streets, Philadelphia, Pa., has awarded contract to the George Kessler Contracting Company for the addition of a third story to its factory, 120 x 160 ft., to cost about \$4,500. W. F. Sauter is president.

The Standard Top Company, Kingston, Pa., has been incorporated with a capital stock of \$12,000 by George G. Stillman, 90 Chester Street; Merton L. Davey, L. Scott Dale, 86 Chester Street, Kingston, and Joseph M. Stark, Hudson, Pa., to manufacture automobile tops and other accessories.

Walter W. Longstreth, Inc., Rosemont, Pa., has been incorporated with a capital stock of \$50,000 by Howard Bierett, 1003 Arrott Street, Philadelphia; Charles H. Longstreth, Ardmore, Pa., and W. Clark Greib, St. Davids, Pa., to manufacture motor vehicles.

The Sullivan Needle Company, Reading, Pa., recently incorporated, according to to press reports, will not manufacture needles at Reading. It controls patents on talking-machine accessories which it manufactures in Massachusetts, but will open a market in Reading. J. E. Sullivan is in charge.

The John Mullen & Sons Iron Works, Shamokin, Pa., has been sold to John H. and C. K. Eagle, who will erect a silk mill on the site. The Mullen Foundry, as it is known, was established in 1870 and manufactured a general line of mining machinery and the Allison steam pump.

The Royalton Shale Brick Co., Royalton, Pa., is planning to enlarge its plant and install new machinery.

The Nolu Oilless Bearing Company, Wilkes-Barre, Pa., has been incorporated with a capital stock of \$20,000 by William F. Wagner, 217 Mount Pleasant Avenue, Philadelphia; Harry G. Price, Philadelphia, and Oscar H. Dilley, Wilkes-Barre, to manufacture anti-friction bearings.

The Spangler Mfg. Company, York, Pa., makers of farm machinery, has moved its plant to Newville, Pa.

The Auto Car Company, Ardmore, Pa., has increased its capital stock from \$1,000,000 to \$2,000,000.

Contract has been awarded to Joseph H. Maguire, 405 Beachtree Street, Philadelphia, for the construction of a one-story concrete boilerhouse for the Sisters of the Good Shepherd, at Thirty-ninth and Pine streets, to cost about \$1,500.

The Turnbull Waste Company has awarded contract to G. H. Yarnall, 7533 Ridge Avenue, Philadelphia, for the construction of a three-story stone engine room and boilerhouse addition, 14 x 30 ft., to be constructed at Leverington Avenue, east of Baker Street, at a cost of about \$2,500.

The Canister Company, Phillipsburg, N. J., has increased its facilities to take care of heavy stampings up to 30-in. draws and is adding buildings to give about 55,000 sq. ft.

additional floorspace to take care of its increased stamping business. It is prepared to handle all metal-stamping work, but is especially equipped for tin stampings. R. W. Dell is treasurer.

M. Rice & Co., 1220 Race Street, Philadelphia, manufacturer of florists' supplies, is having plans drawn by Sauer & Hahn, architect, 1112 Chestnut Street, Philadelphia, for a four-story brick and concrete factory, 54 x 100 ft., to be located at 1220 Spring Street.

New England

BOSTON, MASS., Nov. 1, 1915.

The tide of business in New England is still rising. A good deal of orders continues to pour in to the machine-tool makers, who can only accept those which call for delivery within a short time. The great brass and metal-working industries are making hurried efforts to expand their manufacturing facilities to meet the demands made upon them but the chief factor in new construction and the delays in getting equipment limit the acceptance of orders for early delivery.

Sporadic outbreaks of labor troubles continue to be a part of the day's news, but as a whole the labor situation continues to improve. In many of the industrial centers the lack of trained mechanics and the problem of housing the millions of the working forces are a much greater problem than the unrest in labor circles. Numerous reports of expansions of capital in the metal-working plants show that New England financiers have faith in the solidity of the industrial stocks that are being placed on the market in large quantities.

The Billings & Spencer Company, Hartford, Conn., succeeds Billings & Spencer Company by vote of the stockholders of the latter company. The par value of the stock in the new corporation is \$25 a share, three shares of the new stock are to be exchanged for two shares of the old, and 100 additional shares are offered to the old stockholders at \$25. The increased capital will be used largely to pay for new plant and additional equipment.

The New Departure Mfg. Company, Bristol, Conn., has purchased an acre of land adjoining its present site, to provide for future expansion.

The Lake Torpedo Boat Company, Bridgeport, Conn., has obtained a building permit for a forge shop on the north side of Seaview Avenue.

The American Graphophone Company, Bridgeport, Conn., is building an addition to its boilerhouse on Railroad Avenue.

The Scovill Mfg. Company, Waterbury, Conn., is running full capacity on its regular domestic business in brass goods, and with its increased capacity is taking care of large orders for shrapnel caps and fuses. The past year it has added or is adding to its plant new construction which will create nearly \$2,000,000 in cost. It is reported that its capacity in the same period has increased from 300,000 lb. of fuses to 700,000 lb. It is expected that this production will increase many fold within the next year.

The Hill Smith Metal Goods Company, Boston, Mass., has incorporated with authorized capital of \$50,000 by Albert Gould, Donald M. Hill and Charles L. Flavinger.

The Waltham Machine Tool Company, Waltham, Mass., has been organized with capital of \$1,500 by George J. Eaton, Theodore E. Jewell and J. Fred Rammel.

The Fitzgerald Mfg. Company, Winsted, Conn., will build an addition, 20 x 100 ft., one story, to its plant on Meadow Street.

The Fisk Rubber Company, Chicopee Falls, Mass., which is making extensive additions to its plant, voted at a meeting on Nov. 25, to issue an addition to its first preferred stock of \$100,000. This will make its total outstanding stock \$14,000.

A permit for the erection of an assembly building has been issued to the Bullard Machine Tool Company, Bridgeport, Conn.

The Robert Palmer Shipbuilding Company, Noank, Conn., has resumed operations after two years of idleness. The first contract is for six ship barges for the Philadelphia & Reading Railroad.

The Killingly Mfg. Company, Killingly, Conn., will erect a two-story mill, 152 x 172 ft. This will enable the company to increase its production of automobile tire fabrics from 100 to 100,000 lb. a week.

Some of the departments of Landers, Frary & Clark, New Haven, Conn., are working evenings to keep up with the rush of orders.

The Hein Machine Company, Danbury, Conn., has commenced work on a two-story addition, 16 x 100 ft., to be used principally for grinding balls and bearings.

The Sterling Blower Company, Hartford, Conn., is rapidly

completing its removal from the Colt's west armory to its new quarters in the plant recently purchased at 618 Windsor Street, formerly occupied by the Hartford Foundry Company. The facilities of the company will be largely increased.

The Hopkins & Allen Arms Company, Norwich, Conn., is installing rifle-making machinery as fast as the old machines can be moved to make room for it. The recently purchased plant of the Norwich Nickel & Brass Company on Chestnut Street will be used as a wood-working plant.

The Waterbury Metal Wares Company, Waterbury, Conn., has been incorporated with capital of \$50,000. It will occupy a plant 80 x 100 ft., three stories, formerly used as a pattern storage building by the Waterbury-Farrel Foundry & Machine Company. The factory will be equipped for the manufacture of a general line of metal goods, but the main product will be special electric lighting devices and electrical specialties. L. W. Anderson is president, B. S. Fenton, treasurer, and G. A. Godfrey, secretary. Mr. Anderson and Mr. Fenton were formerly connected with the Plume & Atwood Mfg. Company.

The Vanderpool Mfg. Company, Litchfield, Conn., has increased its capital from \$75,000 to \$125,000.

The Summit Thread Company is adding to its plant at East Hampton, Conn.

It is reported that the Portland Specialty Company, Portland, Conn., has received orders from the Maxim Silencer Company which will require doubling its present working force.

The American Knife & Shear Company, Waterville, Conn., is building a one-story addition.

The Hartford Utilities Mfg. Company, Hartford, Conn., has been incorporated, with \$25,000 capital stock subscribed for. The officers are: President, Robert A. Hamilton, Hartford; vice-president: John R. Phillips, Poughkeepsie, N. Y.; secretary and treasurer, George O. Allen, Unionville, Conn. It will manufacture beds and couches.

A. B. & James Rathbone, Palmer, Mass., wire manufacturers, have begun work on a new plant which will consist of three concrete buildings. The main factory will be one-story, 60 x 140 ft.

It is reported that the Artificial Stone Company, Millers Falls, Mass., will erect a steel castings foundry, 24 x 64 ft., one-story.

The Otis Company, Ware, Mass., will erect a three-story mill to replace one of its present buildings which has been in use since 1845.

The Peter Forg Mfg. Company, Somerville, Mass., general foundry and machine shop, has been incorporated with capital of \$25,000. Peter Forg is president and treasurer.

The International Clay Machinery Company has been incorporated at Portland, Me., with authorized capital of \$200,000. B. L. Merriman is president; William S. Linnell, treasurer, and William M. Bradley, clerk; all of Portland.

Baltimore

BALTIMORE, Md., Nov. 1, 1915.

Negotiations are under way for the taking over of P. Kennedy's Foundry, Wells and Charles streets, Baltimore, by the Baldwin Locomotive Works of Philadelphia. The deal is expected to be closed within the next few days. Several large war orders have been turned out by the foundry and the plant is well equipped. At present a large addition is being constructed.

Papers of incorporation of the Hess Steel Corporation of Maryland are expected to be filed within the next few days. The company, which has been formed by Henry Hess, formerly of Philadelphia, is to be capitalized at \$1,500,000. An electric furnace plant which will turn out high-grade steel products will be built in Baltimore.

Considerable machinery used in the manufacture of war materials was damaged by fire at the plant of the Poole Engineering & Machine Company, Woodberry, Md. Because of the fire it was necessary to temporarily suspend operations in about one-half of the large machine shop. The damage is being rapidly repaired.

Lathes, drilling machines and boring machines, etc., will be installed in the plant of the Morris Iron & Steel Company, Frederick, Md., for the purpose of turning out an order for lathes amounting to \$176,000. It is planned to make the first shipment in about six weeks. John W. Bache, superintendent of the plant, secured the contract from a Philadelphia company. It calls for single-duty lathes, 18-in. swing, 8-ft. 6-in. bed, each weighing 4,200 lb. The completed product will be turned out by the Morris Company and it will be necessary to greatly increase the working force and to operate both night and day. The first installment calls for 322 machines.

The electric light and water pumping plant of Blackstone, Va., which was destroyed by fire, will be rebuilt.

Three 150-hp. water-tube boilers will be installed to heat the group of buildings at Johns Hopkins University, Baltimore. The contract for a power plant and heating system has been awarded the Enterprise Steam & Hot Water Heating Company, 407 North Howard Street, Baltimore.

Curtis Bay, Md., continues to attract a great deal of attention and many building operations are going on in that section. It is said that announcement of additional industries selecting this place for their plants will be made in the near future. The new buildings and improvements which are being made are estimated to represent an expenditure of over \$5,000,000.

The Flong Machine Company, Richmond, Va., has been organized with \$50,000 capital stock. J. M. Thompson is president and W. D. Willis, secretary and treasurer.

Chicago

CHICAGO, ILL., Nov. 1, 1915.

While some of the Western machinery dealers who have been confining their activities to such negotiations as have originated with local or Canadian inquiry are noticing a perhaps only temporary slackening of demand, other foreign business transacted through Eastern centers continues to move in record-breaking volume. Demand for tools for the plants of regular customers is consistently heavier, and it is noted that a number of concerns are postponing until spring the erection of plant extensions which they would be glad to use in the coming winter if they were able to secure machine equipment. Deliveries running into February, particularly of lathes, are now commonly quoted. The situation with respect to high-speed tools has in many respects paralleled machinery conditions. The prospective supply of alloy steels is now so limited that a pinching shortage seems likely to develop within a few months. Most of the sellers of high-speed drills are conserving their stocks for the use of regular customers. An inquiry for 100 dozen high-speed drills in this market last week went begging for this reason. Sales of a small number of single tools to the railroads last week are reported.

The Federal Machinery Sales Company, Chicago, has been organized with a capital of \$50,000 by James Gough, James Jay Sheridan, 35 South Dearborn Street, and A. E. Kaplan.

The Carbo Steel Post Company, 538 South Clark Street, Chicago, with works at Chicago Heights, has changed its name to the Carbo Corporation.

The Western Seamless Pail Company, Chicago, has leased factory buildings at St. Charles, Ill., which it is remodeling and rebuilding at an estimated cost of \$20,000.

The Steel Fabricating Company, Chicago Heights, Ill., has been incorporated with a capital stock of \$75,000 by Charles H. Aldrich, 137 South LaSalle Street, August Draut and Park Phipps.

The Moline Tool Company, Moline, Ill., will build an addition to its plant. Tentative plans call for a building 150 x 200 ft. of steel construction with saw-tooth roof.

The La Plant Company, Marshalltown, Iowa, manufacturer of warm-air furnaces, advises that it expects to have construction work on a brick or concrete foundry, 60 x 200 ft., well under way this fall, although it will not be completed until next spring. It is planned to thoroughly equip the foundry for the manufacture of furnace castings. It will employ a force of 100 men.

Distributors of the Overland motor car at Waterloo, Iowa, are receiving figures on a four story factory, to be 116 x 120 ft., and to cost \$100,000.

The Dauch Mfg. Company, Sandusky, Ohio, advises that it is not building a manufacturing plant at Wichita, Kan., but that the new construction with which it is associated in that city will be used only for sales and warehouse purposes.

The Duluth Ice Company, Duluth, Minn., is erecting an artificial ice plant, which it is estimated will cost about \$75,000.

The Western States Coke Company, recently organized with a capital of \$2,000,000, will build a plant at Minneapolis, Minn. Coke ovens, machine shops and other buildings will be erected.

The Cushman Gas Engine Mfg. Company, a \$75,000 corporation, will locate at Topeka, Kan., and will probably be in operation after Jan. 1.

A. H. Ling, Jetmore, Kan., has let contract for a flour mill and ice plant to cost \$10,000.

The Nuckolls Packing Company, Pueblo, Col., has completed plans for a new packing plant to cost \$300,000.

The Olsen Mfg. Company, manufacturer of hay carriers, Albert Lea, Minn., will erect an addition to its factory, 40 x 50 ft.

The item reporting the H. F. Schivier Mfg. Company, Detroit, Mich., is incorrect. The style of the organization is H. F. Schwier Mfg. Company, Detroit, Mich.

Fire in the grinding room of the chickory plant of E. Muller & Co., Port Huron, Mich., did about \$25,000 worth of damage. It will not be operated until new machinery is secured.

Milwaukee

MILWAUKEE, WIS., Nov. 1, 1915.

Metal-working shops, including foundries, are operating on an average of 90 per cent of capacity, compared with barely 50 per cent six months ago. Were it possible to get more skilled help, it is likely that full capacity would be reached at once. Some apprehension is felt over the prospect of a westward movement in labor troubles. Labor agitators are increasing their efforts from day to day, but nothing definite has developed in Milwaukee and neighboring cities. Machine-tool builders are maintaining the record-breaking productions of the last three to four months, and other lines of the industry are busy on domestic demands. About 40 to 45 per cent of the business in the machine trade is on war account, while six to eight months ago was better than 75 to 80 per cent. Plant extensions are reported from all quarters and many new enterprises are being launched. Public utilities are coming back into the market, but railroads continue to do little purchasing.

The forging shop to be erected by the Bucyrus Company, South Milwaukee, Wis., will be of steel and brick, one-story, 70 x 150 ft. Contracts will be awarded this week.

The A. W. Schram Mfg. Company, which is erecting furniture and hardwood products factory at Ladysmith, Wis., has engaged the Thomas S. Watson Company, consulting engineer, 1412 Majestic Building, Milwaukee, to take bids on installing twenty-two motors and miscellaneous power equipment. The mill is of brick, four stories, 61 x 132 ft.

Bert Stephens, Brodhead, Wis., is remodeling a building into a garage and machine shop.

The Steel Horse Company, Milwaukee, has been organized by William B. Reith, Walter D. Mann and Adolph C. Goll to manufacture gas and kerosene tractors. The capital stock is \$25,000. No details are as yet available.

The A. M. S. Company, Milwaukee, has been organized with a capital stock of \$10,000 by Andreas M. Soennichsen to manufacture automobile parts and accessories. George W. Browne and Thomas C. McMillan are associated with Mr. Soennichsen. A factory is being established in the Manufacturers' Home Building, foot of Mason Street.

The Standard Crucible Steel Casting Company, 719 Thirtieth Street, Milwaukee, is rushed with orders and has found it necessary to enlarge its foundry by a one-story brick and concrete addition, 40 x 40 ft.

The Luther Grinder Mfg. Company, 285 South Water Street, Milwaukee, is obliged to work 24-hr. shifts in several departments in order to keep up with orders.

The Aluminum Goods Mfg. Company, Manitowoc, Wis., will erect an addition to its factory, to cost approximately \$100,000 with equipment. It will be of steel and brick, with mill floors, five stories, 53 ft. 6 in. x 300 ft. Bids on the steel work will be taken until Nov. 6 by Earl F. Miller, architect, Dempsey Block, Manitowoc. The company is also planning to build a new warehouse adjoining its plant.

Carter & Barkle, Eagle River, Wis., has broken ground for a garage and machine shop, two stories, 50 x 55 ft.

A. P. Warner, Beloit, Wis., former head of the Warner Instrument Company, is arranging for the manufacture of an automobile trailer vehicle in Beloit.

The Wisconsin-Minnesota Light & Power Company, Eau Claire, Wis., has started work on the construction of a large power dam on the Chippewa River to cost about \$1,500,000. A. E. Pierce, Eau Claire, is vice-president. The general contract is in the hands of A. Guthrie & Co., St. Paul, Minn.

Schwallen Brothers, New Richmond, Wis., are erecting a concrete garage and machine shop, one story, 50 x 70 ft.

P. A. Peeters, Green Bay, Wis., has organized the Peeters Welding & Cutting Company and established a shop at Pinckney and Jefferson streets.

H. A. Rowe, Clinton, Wis., is establishing a machine shop and automobile repair shop 30 x 50 ft. in the garage of C. A. McCommons.

The Beloit Foundry Company, Beloit, Wis., has purchased a foundry plant in South Beloit and will remove it once. It will nearly double the present capacity.

Articles of incorporation have been filed by the Milwaukee Talking Machine Company, Milwaukee. The capital stock is \$5,000 and the incorporators are C. F. Romdaka, H. V. Heaney and G. W. Goodman.

The Holland Furnace Company, Racine, Wis., has taken out a permit for the erection of a galvanized iron building.

Columbus

COLUMBUS, OHIO, Nov. 1, 1915.

With probably not a single exception, all the local metal working plants are operating at full capacity, or will be within a few days. The Columbus plant of the Carnegie Company, which has been idle for some time, has commenced activities, giving employment to several hundred men. Far not a single factory in this city is making war nations, but many of them are benefited in an indirect way by the unprecedented demand for different kinds of machinery from firms engaged in the business. The most encouraging feature of the situation is an increase in orders in the South that are traceable to improved conditions with the farmers and lumbermen in that section. No labor disputes of any consequence are to be noted and it is generally believed that none will arise during the winter.

Both the gray-iron and steel foundries here are busy. All supply dealers report business as being far ahead of that of last year, with collections also much better. New machinery is in good demand, and orders have been received from many different parts of the country, as well as from South America.

A firm known as the American Mfg. Company, represented by T. G. White, an attorney of Richmond, Ind., has purchased the plant of the Columbus Machine & Tool Company, and is equipping it for the manufacture of lathes and other machine tools. It is estimated that it will install fully \$100,000 worth of machinery to fill orders already in hand. The plant has been devoted for some time to the manufacture of gas engines. Further information may be obtained from W. A. Kelley, manager, Industrial Bureau, Columbus Chamber of Commerce.

The Shaw Wire Fence Company, previously located at Warsaw, Ohio, has purchased a site on Reynolds Avenue, Columbus, on which will be erected a factory to cost \$15,000.

The Atlas Brass Foundry Company, Columbus, has let a contract for a three-story addition to its plant on South Park Street. Additional equipment will be added for the manufacture of automobile parts.

The Foster Gear Company, Columbus, is building an addition to its plant that will nearly double its capacity. Nearly all of the equipment has been purchased.

F. O. Schoedinger, Columbus, sheet metal worker, has recently added considerable equipment to his shop, and will probably need special machinery later on for manufacturing different sheet metal specialties.

The Kilbourne & Jacobs Mfg. Company, Columbus, is now working a night force. Its domestic and Spanish-American business has shown a large increase during the past few weeks. The company intends to have its new addition, built two years ago, fully equipped and in operation by the end of the year.

The new machine shop of the Ohio State University, at Columbus, will be ready for installing the necessary equipment within ninety days. Most of the machine tools have been purchased.

Cleveland

CLEVELAND, OHIO, Nov. 1, 1915.

An order for 115 lathes for work on large high-explosive shells has been placed by the Baldwin Locomotive Works with the Cleveland Machinery & Supply Company. It includes 97 new machines. Foreign demand is good, particularly from Russia, which has several inquiries out for turret lathes, but these are wanted for delivery by Jan. 1, American makers not in a position to take the orders. The labor situation in Cleveland has improved. No additional machinery plants have been affected and many of the men who struck have turned to work. The improvement in other centers has placed dealers in a better position to make deliveries. The general volume of business continues good. While large domestic inquiries have fallen off, orders for small lots of machines are coming from companies engaged on war work.

The Richard Automobile Mfg. Company, Cleveland, Ohio, expects to start work shortly on its new plant on Finney Rd., near East Eightieth Street. The first building will be 120 x 193 ft., of steel and brick.

The plant of the Anderson Rolled Gear Company, Cleveland, will be moved to Toledo, Ohio, having been taken over by the Shaw-Kendall Engineering Company of that city.

The Domestic Electric Company, Cleveland, has been incorporated with a capital stock of \$17,000 to engage in the general manufacturing business. Harry T. Gettins, B. C. Den, H. C. Wood and others are incorporators.

A new brass and aluminum foundry will be established in Akron, Ohio, by C. S. Rinebolt, who was formerly connected with the Crucible Steel Company of that city. It will be

located in the Selfridge handle factory, which is being remodeled for foundry purposes.

It is announced that the Cincinnati, Hamilton & Dayton Railroad Company will erect a power plant in connection with its Lima, Ohio, shops.

A new firm to be incorporated as the Ideal Wheel Company will be established in Massillon, Ohio, for the manufacture of steel wheels for automobiles and motorcycles. Arnold Markel, Cincinnati, will be general manager. It will occupy a building at the plant of the Everhard Company.

The Akron Aluminum Company, Akron, Ohio, has been incorporated with a capital stock of \$10,000 to manufacture aluminum products. W. C. Washburn, George F. Andrews and others are incorporators.

The Toledo Machine & Tool Company, Toledo, Ohio, will enlarge its plant by the erection of a building 100 x 400 ft., three stories, of steel, brick and concrete. The contract for the structural steel and cranes has been awarded to the Toledo Bridge & Crane Company.

The Electric Auto-Lite Company, Toledo, Ohio, will erect a concrete and steel addition, 103 x 355 ft., three stories. It manufactures lamps, horns and other automobile accessories.

Cincinnati

CINCINNATI, OHIO, Nov. 1, 1915.

The local labor situation continues to improve, although demands were made on three additional shops last week. At the largest of these only 121 men went out, representing about 15 per cent of the entire force, and a number have gone back to work. At another plant that has been working a half force for three weeks, its payrolls showed 508 men against 465 the previous week, the increase being confined entirely to its former employees. No effort is being made or contemplated by the employers to settle the present labor difficulties by dealing with shop committees, and the men are returning to work as individuals and not as members of any union.

At Hamilton, Ohio, the situation is not as encouraging. At present five foundries are either closed down, or are operating at a limited capacity. With two exceptions all the machine shops are affected, and employers are making no efforts to operate their plants. It is well known that the majority of the workmen are anxious to resume work, and it is not believed there will be any trouble securing full-sized forces as soon as the shops are opened. Every plant in Oakley, a Cincinnati suburb, is working on full time and with full forces.

The foreign demand for machine tools shows some diminution, but there are indications of an early improvement in domestic business, especially with the railroads. Portable electric drilling machines are in good demand, and one local firm reports the sale of 25 machines to a Russian customer. Wood-working equipment is improving.

The Gordon Machine Company, Cincinnati, has been incorporated with \$10,000 capital stock and will equip a shop on West Eighth Street to do general jobbing work. Louis A. Hauck and C. S. Johnston are among the incorporators.

The George Automatic Roller Bearing Company, Winton Place, Cincinnati, is installing in its main plant a large number of automatic screw machines and grinders. Practically all its equipment has been purchased.

The addition to the plant of the Cincinnati Ball Crank Company, Oakley, Cincinnati, will be 100 x 275 ft., one story, of brick and steel.

The new plant of the Stacey Brothers Gas Construction Company, in Carthage, Cincinnati, is now nearly ready for installation of the necessary machinery. Contract was recently let for a two-story office building adjoining the main factory.

Frank Fox, Cincinnati, will build a garage and repair shop on Fifth Street, near Main Street.

On Oct. 30 the plant of the Cincinnati Stamping Company, 24-34 West McMicken Street, Cincinnati, was damaged by fire, the loss being estimated at \$30,000. Rebuilding operations will commence as soon as insurance adjustments are made, and no delays will be experienced in making shipments on old contracts.

The Heat Spring & Axle Company, Carthage, Cincinnati, is rushing work on an addition to its plant to be approximately 150 x 200 ft., of brick, steel and concrete. It will give the company over 45,000 sq. ft. of floor surface.

The American Diamond Company, Cincinnati, will make an addition to its boiler plant, of brick, 40 x 50 ft.

The Chatfield Mfg. Company, Cincinnati, roofing manufacturer, has had plans prepared for an addition to its plant in Carthage, to be of brick, 60 x 65 ft., two stories.

The Bollman & Wilson Foundry Company, Cincinnati, suffered a fire loss on Oct. 27. Only a slight interruption to its business occurred.

Bids will soon be called for an additional ice plant for the Ice Delivery Company, Cincinnati, to be erected on Price Hill.

The proposed addition to the plant of the Ohio Metal Products Company, Dayton, Ohio, will be 36 x 130 ft., of brick, three stories and basement. Work will commence at an early date.

The American Seeding Machine Company, Springfield, Ohio, has let contract for an addition to its plant to be used as a tool room.

The Clifton Plating & Mfg. Company, Springfield, Ohio, is making an addition to its plant, 25 x 60 ft., three stories, of concrete construction.

The United States Stamping Company, Wheeling, W. Va., will build a steel addition to its plant at Moundsville, W. Va., 150 x 160 ft.

Indianapolis

INDIANAPOLIS, IND., Nov. 1, 1915.

The Indianapolis Straw Binder Company, Indianapolis, has been incorporated with \$10,000 capital stock to take over the business of the Brown Straw Binder Company, manufacturer of farm implements. The directors are O. F. Calvin, S. S. Kiser and Albert Izor.

The Tillman Heating Devices Company, Indianapolis, has increased its capital stock from \$50,000 to \$100,000.

The Quenemo Railroad Tie Mfg. Company, Indianapolis, has been incorporated with \$100,000 capital stock by William Lawless, Charles E. Daugherty and E. A. Lawless to make railroad ties.

The Rochester Bridge Company, Rochester, Ind., has a full shop force and orders booked for three months.

The contract which the Indiana Mfg. Company has with the Indiana State Reformatory at Jeffersonville, Ind., has expired and the trustees will take over the foundry and make it a part of the regular trade school at the reformatory, selling the products to other state institutions.

The Reliable Machine Company, Anderson, Ind., has been incorporated with \$10,000 capital stock to manufacture and repair machinery. Charles Martindale, Charles H. Rawlings and Samuel Maag are the directors.

The clay pot plant of the Gill Clay Pot Company, Muncie, Ind., which was burned Oct. 25 with a loss of \$125,000, will be rebuilt.

The Anchor Supply Company, manufacturer of boat supplies, awnings, etc., is erecting a five-story addition to its factory at Water and Vine streets, Evansville, Ind., which will give it 30,000 sq. ft. of additional floor space. It will be of brick construction.

The Indianapolis Structural Iron Works, Indianapolis, Ind., has been incorporated with a capital of \$50,000 by C. T. Blizzard, C. E. Owen and A. C. Waterman.

The Champion Auto Equipment Company, Chicago, Ill., has purchased a factory at Wabash, Ind., where it will manufacture automobile tires, tire inflators and pumps.

The Fort Wayne Electric Works, Fort Wayne, Ind., will erect a factory just east of its present plant, to cost approximately \$112,000.

The Portland Forge & Foundry Company, Portland, Ind., has announced that it will increase the capacity of its plant by the erection of a new forge department, 50 x 120 ft., in which twelve hammers will be installed.

The Central South

LOUISVILLE, KY., Nov. 1, 1915.

Manufacturing plants in all lines are operating on better schedules than for a long time. Demand for equipment of all kinds continues good. The call for electrical machinery has improved, and steam power equipment is selling well. October was an unusually good month with most local companies, and prospects for the remainder of the year are bright.

The Louisville Pillow Company, Preston and Market streets, Louisville, is in the market for four additional motors with an aggregate capacity of 140 hp. M. P. Kelley is president.

The Roy C. Whayne Supply Company, Lincoln Building, Louisville, is in the market for a 36-in. Simons disk crusher for pulverizing limestone.

Wiley W. Gibson & Son, Mater, Ky., who will build an electric light plant at Whitesburg, Ky., are in the market for equipment, including boilers and engine.

The Love Machinery Company, 519 West Main Street, Lexington, Ky., will establish a foundry. One of the chief features will be the manufacture of lathe castings. James Love is president.

John C. Tate, Ashland, Ky., will establish a factory at Evansville, Ind., for the manufacture of refrigerators. Wood and metal-working machinery will be needed.

Elrod & Co., Columbia, Ky., will establish a plant at Erwin, Tenn., to manufacture automobile spokes, singles and other hardwood stock. A building has been secured.

The Gunther-Wright Machine Company, Owensboro, Ky., is preparing to manufacture a new type of power shear. The plant is running at capacity.

The Anglo-American Mill Company, Owensboro, Ky., which makes flour mills, is operating sixty hours a week all departments.

The Pearsite Company, Pittsburgh, Pa., manufacturer of chemicals, has decided to establish a plant at Clay City, Ky., instead of Caney, Ky. Work has been started on the building.

The Camden Electric Light Company, Camden, Tenn., is in the market for a 90-hp. boiler, 75-hp. engine and other equipment. J. D. Rice is in charge.

The Aluminum Company of America has started the construction of a furnace building at its plant at Maryville, Tenn. Equipment to increase the capacity of the plant 25 per cent will be installed.

W. T. Hicks, New Orleans, La., and M. J. Simpson, Cincinnati, Ohio, are planning to establish a plant at Birmingham, Ala., to make engines and pumps.

St. Louis

ST. LOUIS, MO., Nov. 1, 1915.

Inability to supply the demand for machine tools continues to be further sharply accentuated day by day. The market has been swept bare of practically everything that can be by any possible makeshift to be made to accomplish the wanted. Scouts for the machine-tool dealers are soon to be in the territory for second-hand tools to be repaired or replaced. Even wood-working equipment is being taken wherever it can be found and remodeled into metal-working machines. Inquirers are taking smaller-sized machines than they do to do their work, while those who can only utilize equipment of particular character are being compelled to take extended deliveries even more than a year hence on some portions of their requirements. The Fulton Iron Works has been unable to get anything like the machinery it wanted, and what has obtained is to a large extent of smaller size than originally sought. It is delivery, not price or even of character or condition of the machine that controls at the present moment. The business is hand and in sight in this territory will be dealers at least a year to clear up. Collections are very good. Money is still easy, even for new industries which, however, are handicapped by inability to get equipment. Large lists have been added to requirements, but every day finds a large number of single-tool orders in the market added to those already pending.

Fire Oct. 30 destroyed the mill of the C. F. Liebke Lumber Company, St. Louis, Mo., with a loss of \$50,000. It will be replaced at once, as the mill was working on war orders.

The T. D. Davis Mfg. Company, St. Louis, Mo., has been incorporated with a capital stock of \$30,000 by Harvey D. Brown, George H. Allan and Ralph and Thomas McKittrick to manufacture steel, copper and other metallic devices.

The Siemers-Marshall Engineering Company, St. Louis, Mo., has been incorporated with a capital stock of \$15,000 by George F. L. Siemers, Benjamin W. Marshall and Oliver Frazier will manufacture and install heating and ventilating equipment.

The St. Louis Railway & Dock Company, St. Louis, Mo., is proceeding with plans for the erection and equipment of docks with mechanically operated loading equipment on the Mississippi River at St. Louis. W. J. Holbrook is president.

W. W. Cole, St. Joseph, Mo., has leased a building which will be used as a plant for manufacturing garden hoses, and machinery to cost several thousand dollars will be installed.

A large garage and machine shop, 150 x 182 ft., will be equipped for the Federal Truck Company, St. Louis.

The Automatic Support Mfg. Company, Kansas City, Mo., has been incorporated with a capital stock of \$20,000 by W. Owens, M. B. Brown and L. E. McGrath to manufacture patented collapsible chairs, etc.

The Chestnutt Truck Company, Kansas City, Mo., has been incorporated with a capital stock of \$19,000 by John L. Chestnutt, Earl Clayton and S. W. Chestnutt to manufacture trucks.

The Lesh Pipe Line Company, Arkansas City, Ark., will install a pipe line and pumping plant between Arkansas City and the Blackwell oil field.

The Boller City Iron & Steel Company, Fort Smith, Ark., has been incorporated with a capital of \$25,000 by James W. Arnold, R. W. Cotton and Kittle Collins. It will operate the plant of the former Fort Smith Steel Company.

Heber Springs, Ark., has voted \$90,000 of bonds to equip the waterworks plant for which plans were prepared some time ago.

T. S. Swisher and John Webber, representing the W. A. Bennett Heading Company, Rector, Ark., will establish a heading mill at Walnut Ridge, Ark.

The Dixie Culvert & Metal Company, Shawnee, Okla., is in the market for light sheet metal stamping equipment. The company makes a specialty of automobile license plates.

A complete generating unit will be installed in the electric light plant of the City of Stillwater, Okla. George M. Smith is superintendent.

The United Structural & Iron Works, Okmulgee, Okla., has been incorporated with a capital stock of \$50,000 by J. F. A. Deck, C. M. Roberts and M. Luster, and will install heavy equipment.

The Turner Mower Company, Okmulgee, Okla., has been incorporated with a capital stock of \$20,000 by A. F. Boone, J. B. Turner and Harlan Read.

W. T. Redman of the Perfect Hollow Wall Mfg. Company, Washington, D. C., and Roanoke, Va., will equip a plant at Tulsa, Okla., for the manufacture of metal cores, steel wall forms, etc.

The Enterprise Glass Window Company, Tulsa, Okla., has been incorporated with a capital stock of \$100,000 by M. E. and J. R. Utterback, Tulsa, and W. T. Utterback, Binger, Okla.

The Crystal Ice & Fuel Company, Gulfport, Miss., will spend about \$3,000 on additional equipment for its ice plant.

The sawmill of W. L. Millings, Meridian, Miss., recently burned with about \$10,000 loss, will be replaced.

The Great Southern Lumber Company, Bogalusa, La., will equip a turpentine plant near Columbia, Miss.

The Magnolia Plumbing & Sheet Metal Works, Magnolia, Miss., will install machine shop equipment.

The Ruston Foundry & Machine Shops, Alexandria, La., which have been burned with a loss of \$30,000, will be replaced.

The Mansfield Hard Wood Lumber Company's mill at Mansfield, La., has been burned with a loss of \$55,000.

Birmingham

BIRMINGHAM, ALA., NOV. 1, 1915.

A very fair business is reported by wholesale machinery dealers. The universal complaint is the inability to get machine tools in response to an insistent demand. On occasions delivery as far away as next June is the best that makers promise. The lumber trade is picking up continuously and the demand from mines is improving. Business in all lines is good without special features.

The Allentown Film Company, Florence, Ala., has been incorporated with a capital stock of \$100,000 by M. F. Sherfesee, San Antonio, Texas, Fred Stellar, Birmingham, Ala., and others, to manufacture films.

The Gulf States Steel Corporation will open additional coal mines at Altoona, Ala.

Carson Brothers, Gadsden, Ala., contemplate erecting an ice factory.

The Clinton Cam Company, Clinton, S. C., will manufacture a cam for repairing looms. H. L. Scaife is president and treasurer; A. G. Kennedy is vice-president. The company plans to erect a foundry.

The Southern Lumber & Box Mfg. Company, Rome, Ga., has been incorporated with a capital stock of \$10,000 by W. L. Hume, J. B. Patton and M. A. Nevin Patton, Rome, and Donal and C. L. Hume, Bluefield, W. Va.

Andrew S. Harvey, Rome, Ga., has purchased the plant of Rome Chair Company and will form the Harvey Chair Company and operate the plant.

The Hilton Compress & Warehouse Company, Wilmington, N. C., has been incorporated with a capital stock of \$100,000 by W. B. Cooper, I. W. Cooper, Harry Donkle, and others, and will erect a cotton compress and warehouse, to cost \$50,000.

The Durham Traction Company, Durham, N. C., will install additional pumps at its power plant, as well as a switchboard.

The Brunswick County Lumber Company, Lexington, N. C., is in the market for a second-hand 150-hp. boiler and other equipment for a lumber plant. H. L. Beck is manager.

The North State Lumber Company, Charleston, S. C., is in the market for a second-hand hoisting engine, 7 x 10 or 8 x 10, with drum.

Texas

AUSTIN, TEX., Oct. 30, 1915.

Pumps and engines for irrigation plants are coming into an unusually good fall demand. Many projects of this character are being planned. The machinery and tool trade continues to be satisfactory. The situation in Mexico steadily improves and business and industries in that country are being rapidly revived.

J. J. Kane, Galveston, and associates, will build a drydock and marine ways upon a site recently purchased.

The Gulf, Colorado & Santa Fe Railway will make repairs and improvements to its terminals at Port Bolivar. F. G. Pettibone, Galveston, is vice-president and general manager.

It is reported that J. G. Culbertson, manager of the Wichita Falls Motor Company, Wichita Falls, plans to build a factory at Dallas for the manufacture of motor trucks.

The Rio Grande City Ice, Water & Light Company has been organized at Rio Grande City with a capital stock of \$24,000 to build a water and electric light plant and an ice factory. R. R. Margo is a stockholder.

The Port Arthur Gas & Power Company, which has been organized at Port Arthur with a capital stock of \$250,000, will build a gas plant and an electric power station. J. S. Connally is in charge.

J. E. Maloney, Tularosa, N. M., will install a pumping plant to irrigate 500 acres of land.

The city water commissioners, Temple, plan to substitute electrically driven pumps for steam power at the municipal pumping station at a cost of about \$6,000.

The Interstate Electric Company will spend about \$50,000 in improvements to its electric light, power plant and waterworks systems at San Angelo. E. A. Fitkin, Boston, Mass., is president.

The shops of the Texas & Pacific Railroad at Marshall, Texas, recently destroyed by fire, are to be rebuilt. An appropriation of \$150,000 is reported to have been made.

The Pacific Coast

SEATTLE, WASH., Oct. 26, 1915.

Shipbuilding is one of the most active industries on the Pacific coast at present, in comparison to the facilities available. The Seattle Construction & Drydock Company has a lot of new work on hand, and all the other drydocks in the Puget Sound district, as well as many of the ship-repairing plants on the Columbia River, are working at capacity. The closing of the Panama Canal puts this district at a temporary disadvantage in some ways, but this may be partly compensated by increased railroad activities, and plans are developing for a great deal of new railroad construction in Southern Oregon. Export trade in lumber, as well as in grain and other local food products, is increasing, and a healthier tone is apparent in general business. Equipment for mining and allied industries continues in strong demand. The situation in machine tools is uninteresting, the demand being rather small and the supply much smaller.

Surveys have been completed for an aerial tram from the Richmond mine to the Chicago, Milwaukee & St. Paul Railway at Adair, Mont. The mine is owned by C. Heidenreich, Spokane, Wash., and others.

It is reported that the Balaklala Copper Company is planning to build a sulphuric acid plant in connection with its smelter at Coram, Cal.

The Hypotheek Mining Company has let a contract to a Spokane firm for the construction of a 3½-mile tram from its mine at Kingston, Idaho, to the railroad.

The plant of the Spokane Lumber Company, Milan, Wash., valued at about \$125,000, was burned recently.

The Ogden, Logan & Idaho Railway, Ogden, Utah, has let general construction contracts for interurban freight terminals, car barns and repair shops aggregating in value about \$200,000.

A number of shipments of lumber to Australia have been held up by the lack of tonnage, but this condition is becoming somewhat eased by the chartering of cannery tenders that have completed their summer's work. Some of the largest vessels used in the fish trade have been taken over by the lumbermen and will be put in service.

The chamber of commerce, Spokane, is negotiating with Eastern capitalists, with a view to the establishment of a plant for the manufacture of window glass. It is understood tentative plans have been prepared.

The New Eldorado Mine, Baker, Ore., controlled by a syndicate of which E. B. Reed, Austin, Ore., E. H. Saxe, Lexington, Ore., and D. G. Smith, Spokane, Wash., are members, will add machinery costing \$50,000, including an air compressor and sawmill.

A machine shop and garage has been opened at 426 Park Street, Helena, Mont., by M. A. Miller & Son.

The sawmill plant of the Spokane Lumber Company, Milan, Wash., was completely destroyed by fire recently, with a loss of more than \$125,000. W. C. Ufford, Spokane, Wash., is manager.

Harry Aldis, Chehalis, Wash., plans the immediate erection of a foundry on State Street to replace the one recently destroyed by fire.

H. H. Sebree, Billings, Mont., of the Montana Electric Water Company, Billings, will erect a factory in Forsyth, Mont., to manufacture an automatic water filter. Site has been donated, and construction work will start immediately.

Glasgow, Mont., recently voted a bond issue of \$18,000 for purchasing new equipment for the municipal power and light plant.

The Harmon Machinery Company, Skagway, Alaska, has been incorporated with capital stock of \$50,000 by G. A. Harmon, E. F. Medley and Fred Glasbrenner. It will engage in a general machinery business.

The New York Brass & Iron Company, Spokane, Wash., manufacturer of burner and boiler grates, plans the enlargement of its plant this winter, with the installation of machinery for the manufacture of a new section grate designed for sawmill burners. The company is owned by Leo J. Binder and A. E. Binder.

John Rohrberg, Camas, Wash., plans to enlarge his foundry in Camas to provide for the molding of iron as well as brass and aluminum.

The Oregon Motor Car Company, Portland, Ore., has completed plans providing for the erection of new buildings to cost \$30,000 and having a ground area of 100 x 100 ft.

The Dale-Vincent Mfg. Company, Santa Ana, Cal., has been incorporated with a capital stock of \$12,000, by Hubert Dale, Roy Vincent and L. J. Dale, to manufacture well casing, etc.

F. Stewart, Martinez, Cal., is preparing to install an ice-making plant.

Canada

TORONTO, Nov. 1, 1915.

Over 400 tenders have been received for the new \$80,000 shell contract to be placed in Canada. Those tendering include the four big steel companies, the three big railroads, Canadian Car & Foundry Company, Allis-Chalmers Company, Polson Iron Works, Waterous Engine Works, Dominion Bridge Company and many others. Tender prices vary considerably, but it is proposed that orders be distributed at a fixed price, based on the lowest figure submitted. The small firms declare themselves content to continue making small caliber shells, but many of the larger companies are ready to embark upon the manufacture of ammunition up to the 8-in. size.

The Canadian Vickers, Ltd., 20 Bleury Street, Montreal, will build an addition to its plant for the manufacture of aeroplanes, etc.

The Chevrolet Motor Company, Toronto, will erect a plant at Oshawa, Ont., to manufacture automobile parts, etc.

The Canadian Duplex Steam Trap Company, Ltd., Walkerville, Ont., recently incorporated, will erect a plant to manufacture steam traps, etc.

C. H. Hobson of the Dominion Sugar Company, Wallaceburg, Ont., announced that the company will construct a sugar refinery at Chatham, Ont., to have a capacity of at least 1500 tons per day and to cost \$1,000,000. The foundation will be laid at once. The company intends to construct the plant itself. All inquiries should be addressed to the head office at Wallaceburg.

The Carriage Factories, Ltd., will commence shortly to manufacture automobiles. An assembling plant will be established at Brockville, Ont. T. L. Storey, Brockville, is vice-president.

The O'Brien Munitions, Ltd., Renfrew, Ont., recently incorporated, is erecting a smokeless powder plant there to have a capacity of 35,000 lb. per day.

The Castings Company of Canada, recently incorporated, will erect a forge, foundry and shell factory at Valleyfield, Quebec. The city has passed a by-law to loan the company \$25,000 for this purpose. L. A. Boyer is city clerk.

The Rideau Power Company, Smith's Falls, Ont., is contemplating the installation of two units to complete its hydroelectric power development. M. G. Henniger, 12 Mary Street, is managing director.

T. C. Waller & Sons, Broadway, Tillsonburg, Ont., is considering installing a lathe, drill press and electrical apparatus for charging storage batteries.

Wagstaff & Vestrup, Nakusp, B. C., is in the market for tinsmiths' 30-in. rollers and folders, beading machine with crimpers, etc.

The Port Moody Steel Works, Port Moody, B. C., has secured a site of about ten acres. It must be cleared by Nov. 16, when work on the erection of the plant will be commenced. Fifty men will be employed at the start, and this number will be increased as the business expands.

The Sarnia Metal Products Company, Sarnia, Ont., has received a large contract from the British Government for the manufacture for parts of high explosive shells. Lloyd Lott, manager, announced that the company is installing new machinery in its plant at a cost of \$37,000.

The Montreal Ammunition Company, Ltd., of Montreal, Que., has been incorporated with a capital stock of \$300,000 by George H. D. Vaughan and others to manufacture brass discs and copper bands for shells from its own raw material.

The Imperial Oil Company, Sarnia, Ont., is building three large tanks for storage purposes and is installing ten new stills at its plant.

It is officially announced that the Ontario Hydroelectric Commission has completed the survey for a government powerhouse to be erected between Queenston Heights and Niagara Falls, Ont. Plans are being prepared. It is planned to use the surplus waters of the Welland Canal to develop 300,000 hp.

The Waneta Development Company, Waneta, B. C., will immediately start construction of a hydroelectric power plant to be erected at the confluence of the Columbia and Pend O'Reille rivers, which will have a capacity of 80,000 hp.

The Canada Fishing Tackle Makers, Ltd., Trent River, Ont., has been incorporated with a capital stock of \$40,000 by Andrew Wight, Trent River, G. Grant, Toronto, and others to manufacture fishing tackle, etc.

The Specialty Machine Company, Ltd., Toronto, has been incorporated with a capital stock of \$150,000 by George M. Willoughby, 27 Willcocks Street, Francis H. Hurley, 44 King Street West, and others to manufacture munitions, tools, metals, etc.

The Woodbridge Rudd Harness Company, Ltd., Toronto, has been incorporated with a capital stock of \$100,000 by G. A. Rudd, 787 King Street West, Thomas Woodbridge, Lewis J. Ashley and others to manufacture leather goods, etc.

The St. Catharines Steel & Metal Company, Ltd., St. Catharines, Ont., has been incorporated with a capital stock of \$50,000 by A. E. Rigby, secretary-treasurer, Harry Short, Henry H. Collier and others to manufacture machinery, tools, ammunition, electrical apparatus, etc.

The W. E. Austin Jewelry Company, Ltd., Toronto, has been incorporated with a capital stock of \$50,000 by Charles F. Ritchie, 157 Bay Street, William J. Beaton, 328 Huron Street, and others to manufacture watches, clocks, jewelry, etc.

The Canadian Paramount Pictures Corporation, Ltd., Toronto, has been incorporated with a capital stock of \$2,500,000 by W. J. Beaton, 328 Huron Street, Toronto, K. M. Rutherford and others to manufacture films, motion picture machines, cameras, etc.

The Laurentide Power Company, Ltd., Montreal, has been incorporated with a capital stock of \$10,500,000 by Warwick F. Chipman, Walter R. L. Shanks, Daniel P. Gillmor and others to build and operate light, heat and power plants, etc.

The Neely Rotary Engine Company of Canada, Ltd., Toronto, has been incorporated with a capital stock of \$200,000 by Wilbur F. Neely, care of the John Whitfield Company, 33 Sherbourne Street, Toronto, John Whitfield, Arthur T. Lawson and others to manufacture engines, automobiles, motors, machine castings, tools, etc.

Government Purchases

WASHINGTON, D. C., Nov. 1, 1915.

The quartermaster of the United States army, San Francisco, Cal., will receive sealed proposals until Nov. 8, under schedule 71, for furnishing five portable tubular steam boilers. Lieut.-Col. W. H. Hart is depot quartermaster.

Bids were received by the Bureau of Supplies and Accounts, Navy Department, Washington, Oct. 26, for furnishing supplies for the Navy Yard as follows:

Schedule 8830, Steam Engineering

Class 51, Mare Island—for one automatic disk-notching press, motor-driven—Berger & Carter Company, \$960; E. W. Bliss Company, \$1,220; Canal Lumber Company, informal; Harron, Rickard & McCone, \$1,219; Manning, Maxwell & Moore, \$1,152.

Schedule 8860, Ordnance

Class 94, Washington—for one engine lathe—I. H. Johnson, Jr., Company, \$4,521 and \$4,417; Niles-Bement-Pond Company, \$4,485.

The Severance Mfg. Company, Glassport, Pa., has been awarded contract for rivets, schedule 8743.

MACHINING PROJECTILE SHELLS

Performing the Seven Operations on a Gang of Six Vertical Drilling Machines

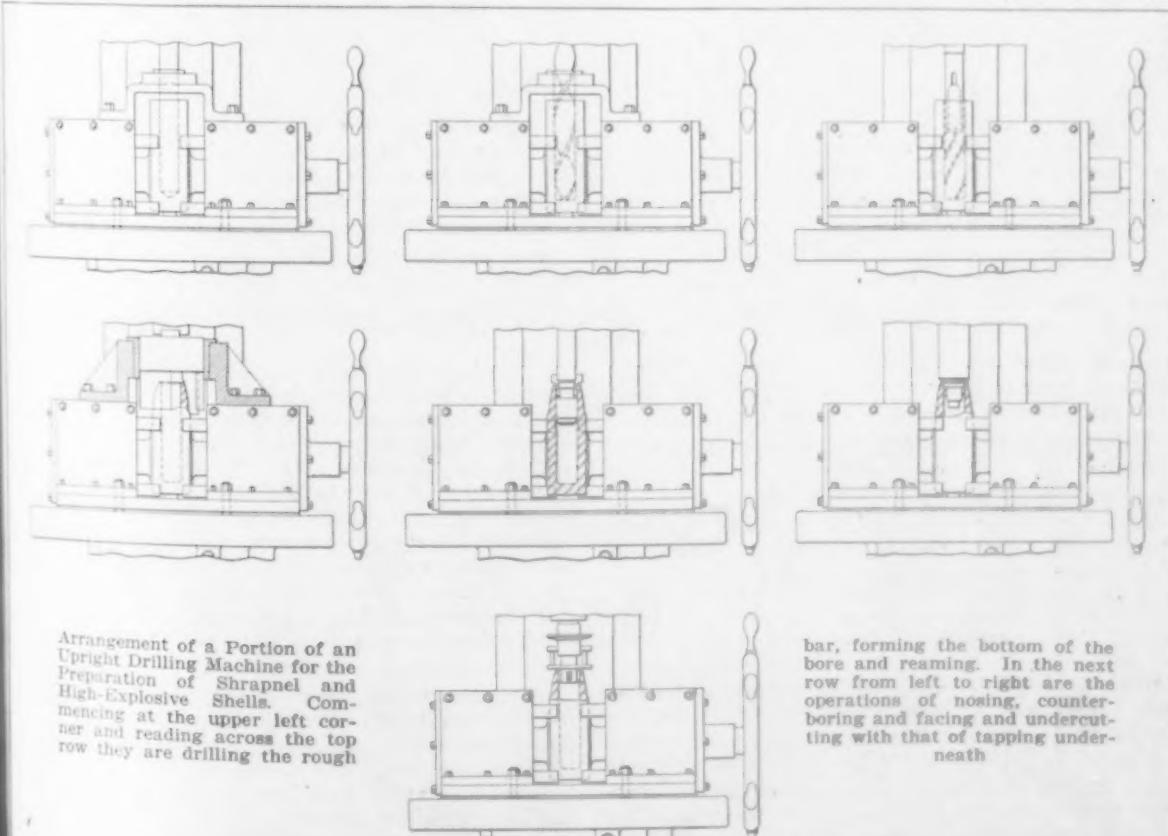
The machining of rough bars for high-explosive shells prior to the lathe work is being handled in some shops on vertical drilling machines built by Baker Brothers, Toledo, Ohio. These machines are arranged in gangs of six and perform the successive operations of drilling the rough bar, forming the bottom of the bore, drilling, nosing, counterboring and facing, undercutting and tapping. Each of the machines performs a single operation only, with one exception, and that performs two, namely, the facing and undercutting and counterboring. With this arrangement of machines a production of eight shells per hour is secured. The machine gang consists of two No. 315 extra heavy pattern single purpose drills of the type illustrated, while the remaining machines are of the builder's No. 310 type.

The first operation consists of drilling a hole 1 13/16 in. in diameter and 8 3/4 in. deep in the rough bar. This is done by chucking the billet in a self-centering specially designed chuck which is clamped to the machine table and the drill is rotated in the spindle as is the usual practice. It is pointed out that no trouble is experienced in ejecting the chips and the operation is performed in approximately 3 min., the drill being driven at a rate of 175 r.p.m. with a feed of 0.02 in. per revolution of the spindle. The arrangement of the chuck, bar and drill is shown in the upper left corner of the accompanying line drawing, the other operations following in order from left to right. After the hole has been bored the billet, which measures 3 1/2 in. in diameter and 9 3/4 in. long, is rechucked on the second machine and the bottom of the bore is formed to the required radius. On the third machine the bore is finish reamed to the required size and on the fourth machine the nose of the shell is formed with



An Upright Drilling Machine Used to Drill, Ream, Nose and Tap the Rough Bars Entering Into Shrapnel and High-Explosive Shells

a specially designed box milling tool. On the fifth machine the shell is faced, undercut and counterbored for the thread in the nose, while on the last machine the thread of the nose is tapped. The chuck centers the billet between four tool steel jaws, operated by right and left-hand screws, the hand-wheel at the right of the chuck controlling the movement of both jaws, an arrangement which, it is

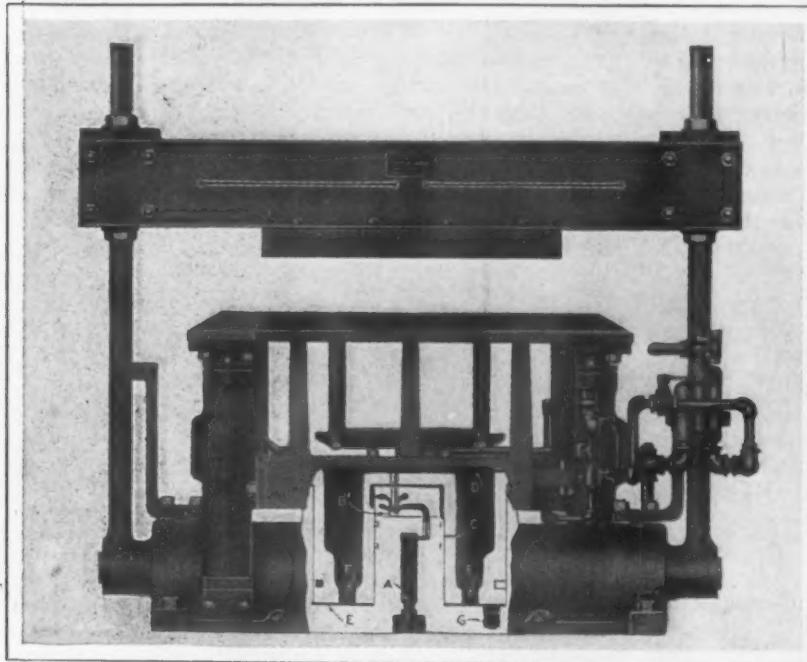


Arrangement of a Portion of an Upright Drilling Machine for the Preparation of Shrapnel and High-Explosive Shells. Commencing at the upper left corner and reading across the top they are drilling the rough

bar, forming the bottom of the bore and reaming. In the next row from left to right are the operations of nosing, counterboring and facing and undercutting with that of tapping underneath

pointed out, makes the chucking of the billet a simple operation. For the first, second and fourth operations the chucks are equipped with a tool support which is clamped to the top of the chuck.

The accompanying halftone shows the machine used for performing the heavier operations of drilling and nosing. The frame of both machines is of heavy box section and a single-belt drive is used, the belt being parallel with the front of the machine, an arrangement which enables it to be placed



A Combination Jolt and Squeeze Ramming Split Pattern Molding Machine in Which the Mold Is Rammed Entirely by Power

in gangs without using quarter-turn belts. An intermediate belt is employed between the speed change box and back gears, and this is made wide, 6-in., with a view to providing ample power. All speed changes are secured by sliding gears, the majority of which are of steel. Eight changes are provided, all of which are quickly made and the shifters lock in place.

There are twelve feed changes provided, three of which are secured by a dive key and are compounded with change gears to give the remainder. The feed pinion is driven by a large phosphor bronze worm gear and hardened worm, the former having a safety device which is set to shear at a load of between 11,000 and 12,000 lb. vertical thrust on the spindle. This shear pin is placed in such a way that four places are provided for it, thus enabling the worm gear to be revolved to secure even wear. If desired friction feed gears can also be employed.

The table is of the knee type and is deep, being reinforced by ribbing. There are no projections about the table which permit the full swing of the machine to be used. Oil grooves are provided around the table, the space inside the grooves measuring 17 x 23 in., while the size of the table, over all, is 23 x 29 in.

What is described as a new departure in marketing waste has been adopted by the Royal Mfg. Company, Rahway, N. J. The purchaser is supplied with a folder of samples so that he can order from it as he would from a sample of fabrics. The company then guarantees a uniform tare as covered, say, in the wrappings, so that if the tare on the bales is greater than the 6 per cent guarantee, a refund will be made for the difference corresponding to the overweight.

Jolt and Squeezer Molding Machine

A combination jolt and squeeze ramming split pattern machine has been placed on the market by E. H. Mumford Company, Elizabeth, N. J. In this machine all the ramming is done by power which, it is emphasized, results in all the molds being rammed to the same density. It is designed for such work as locomotive lubricators and injectors, flanged fittings, motor cycle crankcases, etc.,

and in making the molds for these parts hand tucking and fins around the core points are eliminated. In operation the mold is given a certain number of jolts and squeezes and the pattern is then drawn by the machine. In connection with this power ramming it is pointed out that the output of the machine is increased.

In operation the machine first jolt rams the mold, the air entering through the inlet A and operating the automatic single-piece valve B. The exhaust from the jolt rammer passes through the port C into the open joint between the plunger and the ramming head D through which it finally escapes. During the jolting action, the $\frac{1}{4}$ -in. leather sheet E serves as an impact surface and a valve closing the surge ports F during squeezing to prevent suction and cushion under the squeeze plunger. The mold is next squeeze rammed, the air

coming in through the port G. After the mold is rammed the pattern is started gently by hand and drawn by power while the pattern and flask center lines are kept true by the vibrator frame. The small internal cylinder, it is pointed out, is economical in the use of air.

In the making of a mold for a brass valve requiring a flask measuring 12 x 16 in. x 4 in. in depth in each half, a saving in time of 20 sec. per half mold was effected on the new machine. It is pointed out that the saving on larger and cheaper work is greater. In this plant it has been possible to get perfect lifts continuously on patterns which could not be drawn easily before on account of difficult pockets and corners having little draft.

The American Society of Safety Engineers, an organization incorporated in 1915, but dating from 1911, and made up largely of factory inspectors and others identified with companies doing an employers' liability and workmen's compensation insurance business, at its annual meeting on Oct. 27 in New York elected officers as follows: W. E. Welch, senior contract inspector, Travelers Insurance Company, president; Harry Dehn, Aetna Life Insurance Company, vice-president; C. Van Horn, Travelers Insurance Company, treasurer, and W. J. Pedroncelli, Travelers Insurance Company, 30 East Forty-second Street, New York, secretary.

The conduct of British commercial affairs and the way in which the British Government fosters and directs commercial expansion have been studied by the Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., and a pamphlet has been published covering the subject. It is known as Special Agents Series No. 102 and is obtainable for 5 cents from the Superintendent of Documents, Washington, D. C.

National Machine Tool Builders' Meeting

(Continued from page 1063)

idea. Terms of payment must be made more liberal, as has been pointed out repeatedly, and in this connection he told of an Australian who had come to his office with a complaint regarding the strict terms exacted of him. "Your dollar," said the visitor, "bears the inscription: 'In God We Trust.' With all others, it is cash, f.o.b. New York."

ADDRESSES AND UNFINISHED BUSINESS, FRIDAY

At the Friday afternoon session, Mr. Lodge, for the resolutions committee, offered a resolution, which was adopted in amended form, to the effect that all proposals made to the Government, municipalities and others who asked for proposals to be opened on a fixed day must contain a clause, or a statement in an accompanying letter, that the deliveries quoted are subject to acceptance within ten days from the advertised date of the opening of the bids. Mr. Doan objected to the resolution, as he thought it might give offense, but the general sentiment was in favor of it, the only discussion being over the wording. Mr. Lodge pointed out that if

the Government, in making an award, delayed thirty or more days, as sometimes happened, deliveries could be made only with difficulty, if at all, especially in times like the present. Mr. Viall surrendered the chair to talk on the resolution and strongly favored its adoption. Mr. Heald urged the selection of the proper wording. The suggestion of C. Wood Walter, Cincinnati Milling Machine Company, that "deliveries quoted are subject to acceptance within ten days from the advertised opening date of the bids" was accepted.

P. G. March reported for the auditing committee, finding all the accounts correct and complimenting the treasurer for the neatness of his records. On motion of Mr. Viall the convention voted that the next meeting be held at Cincinnati.

Mr. Hildreth paid a warm tribute to Mr. Viall, whom he called a splendid friend and grand leader, and at his suggestion the members expressed their appreciation of the services of the retiring president by a rising vote. Mr. Viall responded with a few words. He said many of the members were going back to their homes to find black things on their tables, serious problems which must be solved within a few days, and he urged them to take with them the inspiration of the meeting and be helped by it.

Machinery Dealers Meet to Discuss Problems

The machinery division of the National Supply & Machinery Dealers' Association conformed to its usual practice of holding a meeting at the same time and place as that of the National Machine Tool Builders' Association. The dealers, however, finished their business in one day, Oct. 28. The attendance was fair. The meeting was called to order by W. J. Radcliffe, E. A. Kinsey Company, Cincinnati, Ohio, first vice-president, and by virtue of that office in charge of the association's machinery interests. His address was informal.

Secretary Thomas A. Fernley, in the course of his report said:

Unprecedented conditions have been with us and have created a greater demand for machine tools than ever known before in the history of the United States, and probably in the history of any other country. While this large volume of business has been enjoyed, the thought has arisen in the minds of the members of the association that the trade should be prepared to meet conditions when the present heavy demand ceases.

UNIFORM CONTRACT HAS PROVED VALUABLE

The association has had frequent calls for copies of the uniform contract adopted by the machine tool dealers and machine tool builders some seven years ago, which specifically sets forth the method of handling questions which might arise regarding the territory in which machine tools were shipped, etc., and the rights of the various dealers. This contract has been worth scores of thousands of dollars to the members of this association during the past year and is one of the direct benefits which has been brought about through the work of this organization. Under the old conditions which prevailed before the formation of this association, the machine tool business was not conducted upon lines which made easy the settlement of controversies regarding the sales of machine tools in territory not immediately adjacent to the dealers' city. This contract set down clearly the best information of the trade with regard to the various clauses which should be incorporated in a contract between the dealer and manufacturer covering exclusive selling provisions within a respected area.

The manufacturers who have carefully looked into the situation and who have been supplied with data by your secretary's office, freely concede the fact that the distribution of machinery can be handled more eco-

nomicly through the dealer than direct from the factory by individual salesmen, and the recognition of this fact makes a far more satisfactory situation than existed some four or five years ago when it was not so generally accepted. The organization has enjoyed pleasant relations with the manufacturers and under the present prosperous conditions we look for a continuance of relations which are mutually satisfactory.

Several problems pertinent to the business of dealing in machinery were discussed, one being the difficulty under present conditions of getting machines with which to serve their trade. It was conceded that none can tell what the dealer will encounter when the war ends, though the opinion was expressed that many of the machines now being sold will never reach the second-hand market inasmuch as they will be worn out, largely through unskillful handling by untrained workmen. Stress was laid on the hazardous character of some of the orders now to be had and it was pointed out that, except in exceptional cases, a high percentage of the value of an order should be obtained with the contract. It was concluded that dealers should not be backward in following the lead of the manufacturers in securing payment.

In a talk on organization, Henry Prentiss, Prentiss Tool & Supply Company, New York, said:

MR. PRENTISS ON SELLING ORGANIZATION

I can think of no subject more important than an efficient selling organization. Our manufacturers are constantly improving their methods of manufacture and quality of product and naturally expect their selling agents to be imbued with a similar spirit of progress, otherwise the connection is likely to be terminated and this source of income cut off.

I believe it is almost the universal experience of members engaged in marketing machine tools that the successful salesmen come up from the ranks or, in other words, they are not ready made, but grow up into usefulness. It is of primary importance in selecting such men, to be sure of these qualifications—that they are equipped with the temperament, initiative and character required, together with a good English education as well as a good understanding of mathematics, and these endowments should be supplemented

by practical experience in the construction and application of machine tools. It is not easy to find such men, which makes it all the more necessary that we should be at all times alert to this need, so as not to miss an opportunity of supplying it.

If our selections do not have the technical knowledge and mechanical experience required, then if equipped with the other necessary qualifications of salesmanship, they should be willing to acquire the lacking essentials by devoting the necessary time and effort to obtain these. If we strengthen our present selling organization with men of this type, this policy will surely bear the expected fruitage. It takes time to accomplish this as it does everything worth having, but the final result is sure.

It is less and less a question of price in effecting sales of machine tools at the present day; such sales hinge upon the ability of the salesman to convince the prospective buyer of the merits of the tools he offers, regardless of price, as an investment—a productive unit in his plant. The successful salesman to-day must also be able to suggest to the user, as conditions warrant, change in his equipment which will lower manufacturing costs to meet competition and thus protect, if not increase, net profits.

A selling organization of this nature can be built up only by inaugurating and persistently following a settled policy, which is expressed in employing only salesmen of good ability and experience (or such as can develop these qualifications rapidly); men of intelligence and trustworthy, who, in the use of this equipment, are able to gain and hold the confidence of their patrons already secured and in prospect. Such an organization with a business policy founded on principle rather than expediency, and with equally efficient methods employed in all other departments of our business, will give us a well earned satisfaction and assured success.

OTHER QUESTIONS CONSIDERED

With regard to the functions of the dealer in promoting the sale of machinery, the opinion was expressed that it is more advisable to work with practical shop superintendents rather than with engineers or officials if the latter have too theoretical tendencies. Where unremunerative canvassing or missionary work is done with a view of introducing new tools, the members believed that the cost should be divided between manufacturers and dealers, or that special compensation should be arranged. The question was raised as to how dealers should protect themselves in case of a sudden recession in prices which would leave the dealers with machines in stock or under contract for which they had paid war prices. The general opinion was that in such a contingency the manufacturers would take measures to insure relief.

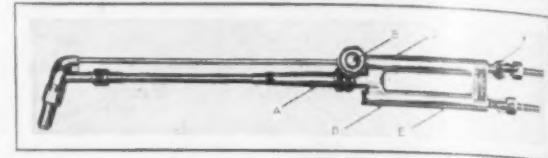
Ore Sintering Apparatus

In a new apparatus for sintering ores, cars are provided with grate bottoms and delivered from transfer trucks to elevated tracks. They pass under an ore hopper, thus receiving a charge; they then pass into a furnace where the top of the charge is ignited by means of gas or oil burners. On entering the furnace the cars also register with a suction box below the tracks and connected with a fan operated by a motor. The ignited charge is thus subjected to a downward draft, sintering the mass. On completion of this operation the car is delivered to a transfer truck and removed to a discharge point. The apparatus is covered by a patent (U. S. 1,140,710) granted to Albert F. Plock, Pittsburgh.

Commercial failures in the United States for the first nine months of this year were 17,288, representing liabilities of \$241,464,060. In number this is the largest on record for a similar period, but the liabilities were smaller than the \$271,918,021 in 1914.

Oxy-Acetylene Welding and Cutting Torch

The Modern Engineering Company, St. Louis, Mo., has placed on the market a torch for use in connection with the oxy-acetylene process for cutting and welding



A Recently Developed Torch for Autogenous Welding and Cutting Having Special Provision for Attaching the Cutter Readily

metals. The features characterizing this torch are a check valve system to guard against either gas flowing in the passage of the other, the use of a one-piece handle and ease in attaching the cutter to the torch.

A special metal is used for the handle of the torch *E* which is cast in one piece, emphasis being laid upon the fact that the metal is stronger than brass and yet does not weigh as much as aluminum. The mixing chamber *A* is of bronze and is designed to produce a neutral flame of a temperature of over 6300 deg. Fahr. Automatic check valves *C* and *D* are relied upon to prevent either gas from flowing into the passage of the other and thus burning back into the hose.

The cutter which is controlled by the needle valve *B* is easily attached to the torch. The necessity for removing the hose connections at *F* is eliminated. In attaching the cutter only two operations are necessary. The nut on the oxygen valve and the union nut on the gas conduit are removed, which makes the torch ready to receive the cutter. After the nuts are tightened the welding torch is changed into the cutting apparatus as shown in the accompanying illustration.

Cost of Compensation in Wisconsin

Advance figures of the annual report of the Industrial Commission of Wisconsin show that in the fiscal year ended June 30, 1915, employers paid \$1,350,000 under the workman's compensation act. In the four years the act has been in operation, the number of employers who have elected to come under its provisions has increased from 61 to approximately 13,000, and the number of employees within its protection from 17,000 to more than 255,000. The past year the total number of accidents exceeded 12,000, and the total number of claims settled was 11,377. The total direct cost of the act is about 82 cents per \$100 of payroll on the average of all industries. The cost per case settled was \$1.19, compared with \$1.20 the previous year.

Making Practically Pure Iron

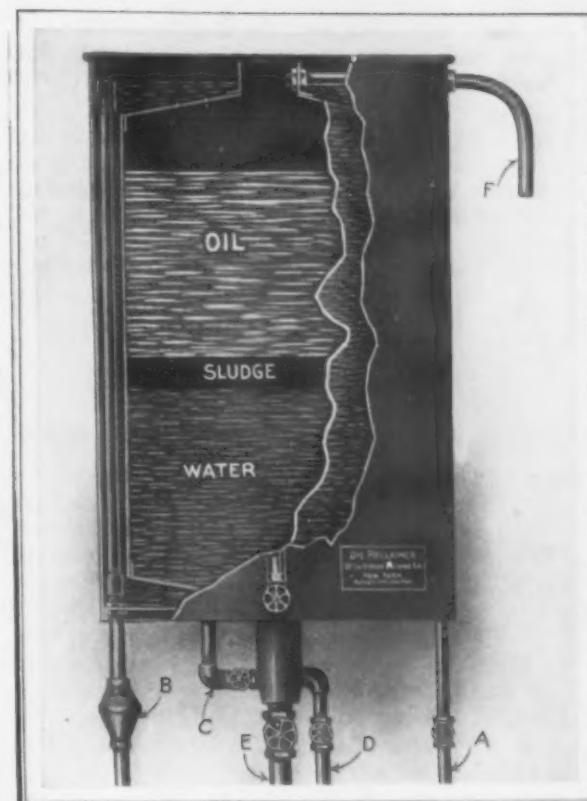
A method of making practically pure iron is offered by Arthur P. Scott, formerly of Brackenridge, Pa., in a patent (U. S. 1,144,256—June 22, 1915), assigned to the Allegheny Steel Company, Pittsburgh. The object is to treat the metal bath so as to remove the usually occluded slag particles or globules which are distributed through the metal in the ladle just after tapping and held there by the internal friction of the slag against the steel. The claim is advanced that, because the molten iron is usually promptly poured into the molds, these impurities become entrapped in the solidifying metal. Advantage is taken of the fact that the smaller a body is the greater is the proportionate friction surface it presents and that when a plurality of such small bodies is combined this friction surface is decreased. When the desired purity is obtained and the metal is tapped from a furnace into the ladle, it is allowed to remain tranquil for four or more minutes before teeming, thus allowing the slag to float out. Practically pure iron is claimed to be the result of the procedure.

RECLAIMING USED LUBRICANT

Apparatus for Freeing Internal Combustion Engine Oil from Unconsumed Carbon

To separate undesirable carbon particles and other foreign matter from used bearing lubricating oils an apparatus has recently been placed on the market, adaptable especially to installations of internal combustion engines where carbon particles frequently get past the piston and into the surplus lubricating oil from the bearings. The reclaimer operates on a combination of the gravity settling principle and coagulation. A small amount of powdered coagulant known as Oilite is introduced into the dirty oil and with the use of hot water and agitation each little particle of solid matter is surrounded with a film which, it is explained, forces it to drop out of suspension in the oil. The agitation, which extends over a period of about 20 min., is accomplished by compressed air and is employed merely to secure intimate contact of the coagulant with all the impurities. The entire operation is practically automatic, it being necessary to manipulate only a few valves.

The reclaimer, as shown in the accompanying illustration, provides for an inner receptacle in which the oil to be reclaimed is placed. This is surrounded by an outer shell and space is provided between the two for warm water from the jackets of the engine. In operation the oil dripping from the crankcase flows through the pipe *H* into the reservoir located under the floor at the right of the engine. Water is also required inside the inner shell to secure a better solution of the Oilite and the circulating jacket water passes through the pipe *A* into the reclaimer until there are approximately 40 gal. of hot water in the inner tank, the water passing through the pipe *C* which forms a connection between the inner and outer tanks. About 8 lb. of coagulant is added to the water in the inner tank and compressed air is admitted through the pipe *I* to the dirty oil reservoir. This forces the oil up through the pipe *D* into the inner tank, where the mixture is agitated for about 20 min. by the admission of more compressed air. The space between the inner and outer tanks is then filled with jacket water at a temperature of approximately 160 deg. Fahr. that circulates in this space for from 12 to



Reclaimer for the Lubricant Used in Internal Combustion Engines with a Portion of the Cover Broken Away to Show the Relative Positions of the Purified Oil, Impurities and Water Used

24 hr. during which time the contents of the inner tank separate into three well-defined sections of oil, sludge and water as shown in the accompanying halftone.

Upon the completion of the settling process the valve in the connection between the two tanks is opened and as the water level in the outer one is higher, the exact height being regulated by the adjustable nipple on the pipe *B*, the level of the water becomes the same in both tanks with the result that the oil which is on top is forced out through the pipe *F* into a storage tank. The adjustment of the nipple at the top of the overflow pipe *B* is such that the nipple in the outside tank is just below the opening in the outlet pipe. When all the clean oil has been drawn off, the valve in

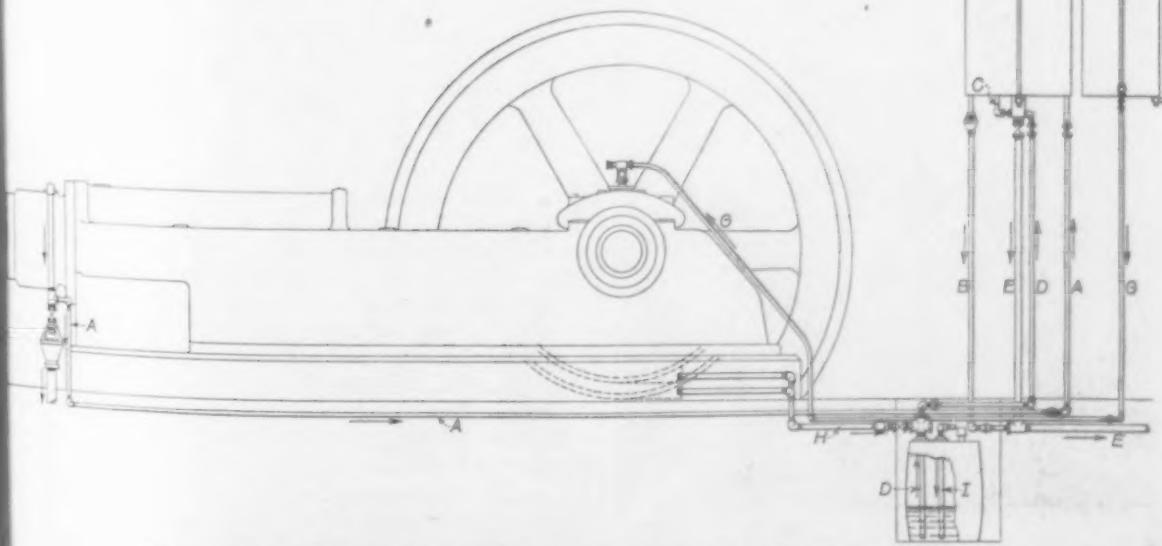


Diagram of a Typical Installation Showing the Arrangement of the Various Piping Lines

the pipe *C* is closed and the one in the pipe *E* opened. This causes the water and sludge to flow to the sewer and the reclaimer is then ready to purify more oil. The purified oil flows out of the storage tank through the pipe *G* to the bearings of the engine and the cycle of operation is repeated.

In tests which have been conducted on this reclaimer, it has been found that from 80 to 91 per cent of the mixture placed in the inner tank has been recovered as oil in suitable condition to be used over again. The oil reclaimer has been brought out by the De La Vergne Machine Company, foot of East 138th Street, New York City.

Banding and Nosing Press for Shrapnel

A new combination banding and nosing press for steel shells was recently perfected in the plant of the Canadian Locomotive Company, Kingston, Ontario, and that company has turned over to the Cleveland Crane & Engineering Company, Wickliffe, Ohio, the right to manufacture and sell the press in the United States. The general construction of the press, which is simple in design and operation, as equipped for nosing is shown in the accompanying illustration. A cover plate 46½ in. in diameter is set over the top of the press but this was not in place when the view was taken.

In the large cylinder shown under the body of the press is a 28-in. piston, and to the top of the piston are cast six lugs which in turn operate six toggle joints located in the channels in the frame. These toggle joints carry the jaws for pressing or squeezing the copper band in place after the shell has been placed in a vertical position in the hole in the center of the frame. Two pressing operations are necessary, and between the first and second operation the shell is turned about 90 deg. Air at 100-lb. pressure is admitted to the cylinder, a single lever controlling the admission and the exhaust of the air to and from the cylinder. The top of the press is at a comfortable working position above the floor.

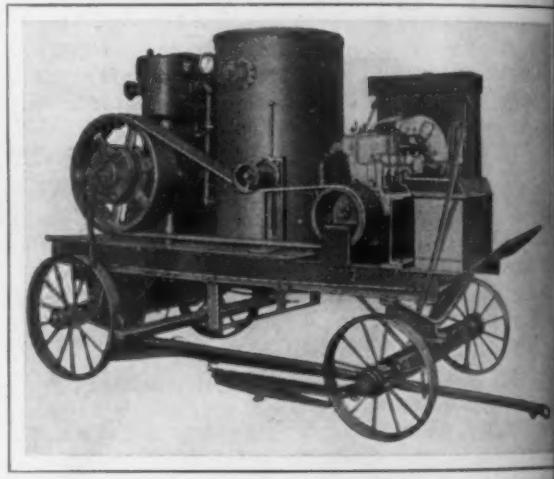
When used for nosing the band plate is removed and in its place is substituted the housing that is shown above the bed. A nosing die having a coni-

cal shape to correspond to the nose of the pointed shell is fastened in an inverted position to the top of the housing. Beneath the hole in the center of the frame in which the shell is placed during the operations is a smaller hole in the top of the main piston and in this a smaller piston that rides on the main piston is inserted, the shell standing on the small piston during the nosing operation. Air is admitted to the main cylinder and the shell is forced vertically into the nosing die, making the operation a simple one and quickly performed.

The press illustrated is designed for nosing and banding 3 and 3½ in. shells weighing up to 78 lb. It is stated that it has a capacity of nosing 150 and banding 200 shells per hour. It is also made in a larger size for banding and marking 4½ to 6 in. shells weighing up to 60 lb., but it is not designed for nosing a shell larger than an 18-lb. For the larger sizes a marking die for stamping numbers is substituted for the nosing die.

New Air Compressor of the Portable Type

For work where portability is desirable the Zin-Ho Mfg. Company, 1324 Michigan Avenue, Chicago, Ill., has brought out an air compressor. Among the



A New Type of Portable Air Compressor Equipped with Special Starting Arrangement

fields for which the compressor is designed apart from steel erection is the shop where the assembly work is scattered over a large floor area or is conducted intermittently in the plant yard. The special feature of the compressor is the use of a safety starting coupling.

As may be noted from the accompanying illustration the compressor is a combination of a standard gasoline engine, an air compressor of the crank and plunger type and an air receiver mounted on a steel truck. The engine is of the four-cylinder four cycle marine or heavy tractor type and transmits power to the compressor by a belt. When air is not required the engine can be used to supply power for other purposes. The air compressor is of the vertical inclosed type with a cooling system that is separate from that of the engine. A safety starting coupling is provided to insure the engine starting at the initial cranking revolution and a speed control governor is relied upon to keep the speed constant irrespective of whether the compressor is pumping or unloading. A multiple-disk clutch is employed to secure an even starting of the compressor.

The compressor is built in eight sizes, varying in capacity from 21 to 400 cu. ft. of free air per minute. The weight of the various sizes ranges from 1800 to 12,000 lb.



A Combination Banding and Nosing Press for Shrapnel Shells Arranged for the Latter Operation

